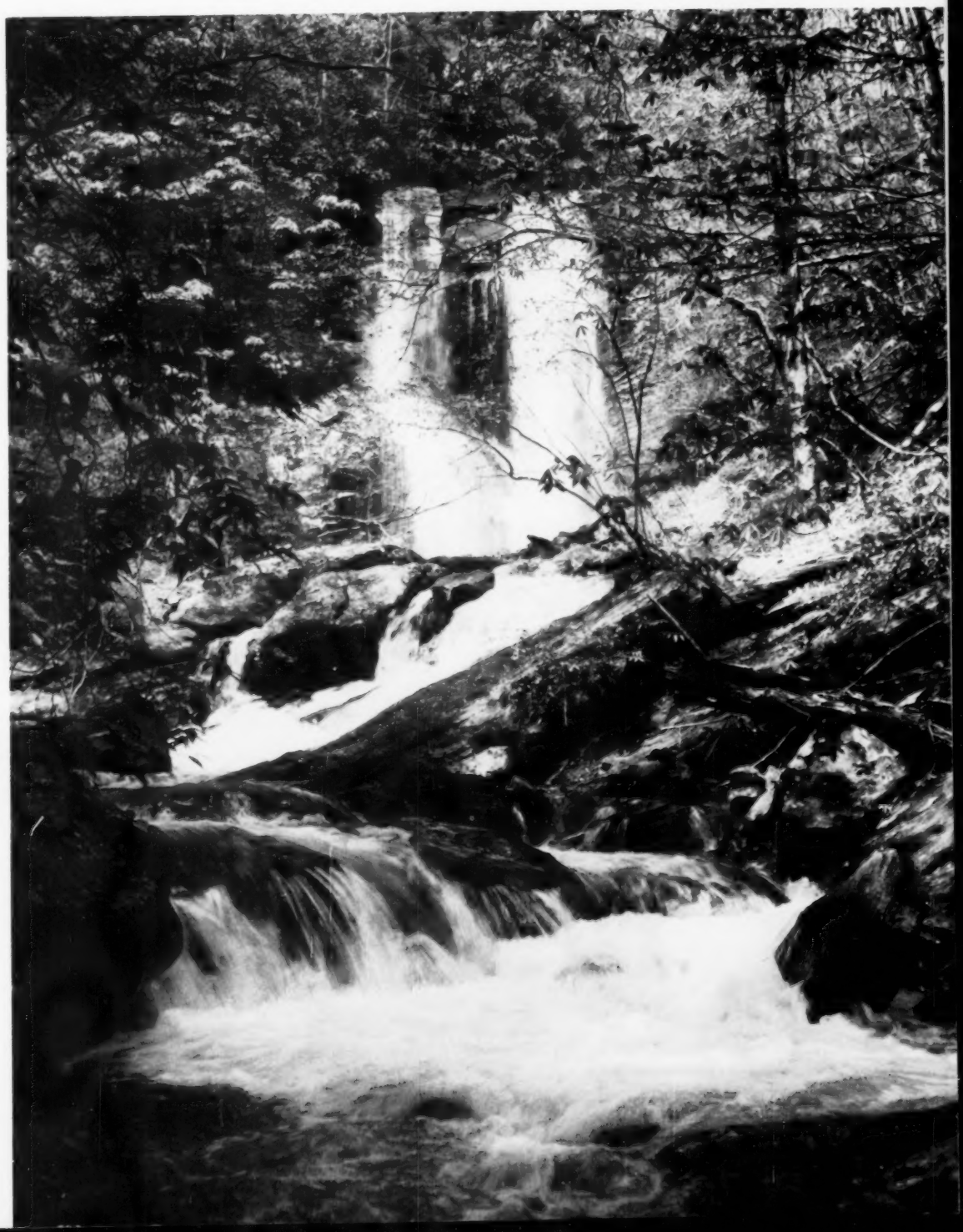
Journal of FORESTRY

May 1957



SOCIETY OF AMERICAN FORESTERS 1900

Volume 55
Number 5

MANY INDIAN FIRE PUMPS

ARE STILL IN SERVICE AFTER 20 YEARS . . .

Designed and built to take punishment,

INDIAN FIRE PUMPS stay on the job for years with little or no maintenance.

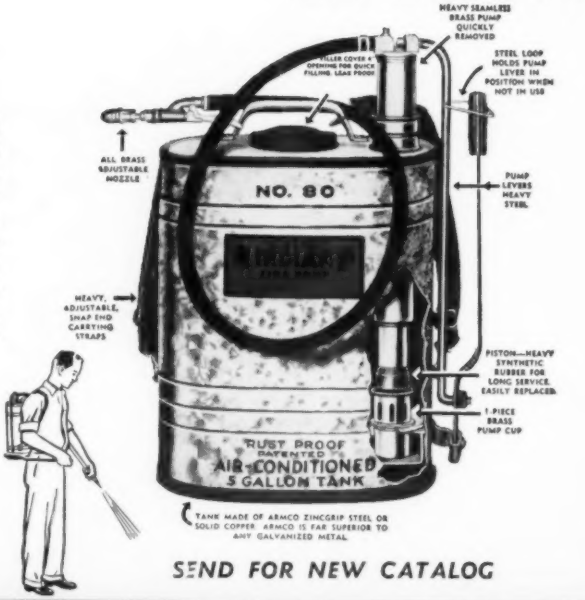
No. 90 INDIAN SLIDING PUMP TYPE

"We discarded soda acid type extinguishers and equipped with **INDIAN FIRE PUMPS** which give great satisfaction with only clear water. Our new truck is equipped with **INDIANS** instead of the usual chemical extinguishers. We cannot praise them too highly."

Chief H. B. Wells
Newbury, S. C.

Both types of INDIAN FIRE PUMPS are approved by UNDERWRITERS' LABORATORIES.

No. 80 INDIAN LEVER TYPE PUMP and HANDLE


HEAVY SEAMLESS BRASS PUMP QUICKLY REMOVED
STEEL LOOP HOLDS PUMP LEVER IN POSITION WHEN NOT IN USE
ALL BRASS ADJUSTABLE NOZZLE
PUMP LEVERS HEAVY STEEL
NO. 80
HEAVY, ADJUSTABLE, SNAP END CARRYING STRAPS
PISTON—HEAVY SYNTHETIC RUBBER FOR LONG SERVICE EASILY REPLACED
1-PIECE BRASS PUMP CUP
RUST PROOF PATENTED AIR-CONDITIONED 5 GALLON TANK
TANK MADE OF ARMCO ZINCGRIP STEEL OR SOLID COPPER. ARMCO IS FAR SUPERIOR TO ANY GALVANIZED METAL

SEND FOR NEW CATALOG

D. B. SMITH & CO. 407 Main St., Utica 2, N. Y.

"FOR 70 YEARS THE LEADERS"

Canadian Agents:
Fleck Bros., Ltd., Vancouver, B. C., Canada
C. E. Hickey & Sons, Ltd., Hamilton, Canada
Bison Hardware Co., Toronto, Ont., Canada

Pacific Coast Branches:
Hercules Equipment & Rubber Co., Inc., San Francisco 7, Calif.
Fred E. Barnett Co., Portland, Ore.
Mill & Mine Supply Co., Seattle 4, Wash.
Halprin Supply Co., Los Angeles 15, Calif.
Fred E. Barnett Co., Klamath Falls, Ore.
L. M. Curtis & Sons, Salt Lake City, Utah

VOLUME 55 • NUMBER 5 MAY 1957

Journal of Forestry

Editorial Staff

ARTHUR B. MEYER ..... *Editor*

HENRY CLEPPER ..... *Managing Editor*

L. AUDREY WARREN ..... *Business Manager*

Associate Editors

R. KEITH ARNOLD, *Forest Fire*, California Forest and Range Experiment Station, P. O. Box 245, Berkeley 1, Calif.

ROBERT R. BLUMENSTEIN, *Forest and Wood Utilization*, Timber Engineering Company, 4812 Minnesota Avenue, N. E., Washington 19, D. C.

ROBERT E. DILS, *Watershed Management*, School of Natural Resources, University of Michigan, Ann Arbor, Mich.

JOHN W. DUFFIELD, *Silviculture*, Col. W. B. Greeley Forest Nursery, P. O. Box 172, Nisqually, Wash.

S. R. GEVORKIANTZ, *Mensuration*, Lake States Forest Experiment Station, University Farm, St. Paul 1, Minn.

HARVEY J. MACALONEY, *Forest Pathology and Entomology*, Lake States Forest Experiment Station, St. Paul Campus, University of Minnesota, St. Paul 1, Minn.

RALPH W. MARQUIS, *Forest Economics and Policy*, Northeastern Forest Experiment Station, 102 Motors Avenue, Upper Darby, Pa.

CHARLES E. POULTON, *Range Management*, Withycombe Hall 302, Oregon State College, Corvallis, Ore.

CLARENCE W. RICHEN, *Forest Management and Engineering*, Crown Zellerbach Corporation, Public Service Building, Portland 4, Ore.

PHILIP C. WAKELEY, *Forest Genetics and Artificial Regeneration*, Southern Forest Experiment Station, 704 Lowich Building, 2026 St. Charles Avenue, New Orleans 13, La.

LEE E. YEAGER, *Forest-Wildlife Management and Recreation*, Colorado Cooperative Wildlife Research Unit, 243 Forestry Building, Colorado A & M College, Fort Collins, Colo.

LLOYD THORPE, *Advertising Representative*, 6133 Arcade Building, Seattle 1, Wash.

The JOURNAL OF FORESTRY, established in 1917, is the official organ of the Society of American Foresters, but the Society assumes no responsibility for the statements and opinions expressed by contributors.

Publication office, 425 Mills Building, 17th Street at Pennsylvania Avenue N. W., Washington 6, D. C. Address all correspondence concerning editorial or business matters to JOURNAL OF FORESTRY, 425 Mills Building, 17th Street at Pennsylvania Avenue N. W., Washington 6, D. C. Published monthly. Subscription $7.50 per year; single copies 75 cents. Missing numbers will be replaced without charge provided claim is made within thirty days after date of the following issue.

The editors are not responsible for loss or damage of manuscripts and photographs while in transit or in their possession. All material submitted for publication should be accompanied by return postage.

Copyright, 1957, by the Society of American Foresters. **Entered as second-class matter at the post office at Washington, D. C. Acceptance for mailing at the special rate of postage provided for in the Act of February 28, 1925, embodied in Paragraph 4, Section 412, P. L. and R. authorized November 10, 1927.**

CONTENTS

COVER: York Creek Falls, Chattahoochee National Forest, Georgia
Photo courtesy of U. S. Forest Service, taken by Daniel O. Todd.

How Far from a Stream Should a Logging Road Be Located?
George R. Trimble, Jr., and *Richard S. Sartz* 339

Browse Quality and the Effects of Prescribed Burning in Southern Pine Forests
Daniel W. Lay 342

The Forest History Foundation, Inc.
Elwood R. Maunder 348

Combining Two Species with Different Rotational Ages in Determining the Allowable Annual Cut
John F. Bell and *Marvin L. Helland* 351

Low-Grade Hardwood Stands in the Missouri Ozarks Respond to Stand Improvement
F. Bryan Clark and *Franklin G. Liming* 354

Bud-Pruning Red Pine and Eastern White Pine in Northern Illinois. *Howard W. Fox* 359

Effects of Site Treatment, Fertilization, and Brownspot Control on Planted Longleaf Pine
Harold J. Derr 364

Volume Determinations from Aerial Stand Volume Tables and Their Accuracy
H. A. Meyer and *D. P. Worley* 368

Surface Runoff and Erosion as Related to Prescribed Burning
H. H. Biswell and *A. M. Schultz* 372

Notes 375
Determining Fire Prevention Goals; A Note on Recent Soviet Timber Industry Statistics; Field Key-Punching of Forestry Data; Ratios for Determining the Economic Road and Landing or Skidway Spacing.

We Present 380
Ralph Sheldon Hosmer

Reviews 382
The Future of Arid Lands; Federal Timber Sales Policies; Plant Propagation; Publications of Interest.

Current Literature 385

Society Affairs 386

Forestry News 397

Index to Advertisers 416

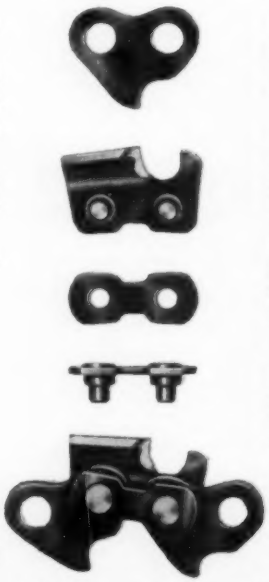
. . . It's *ALL* NEW

From the raw materials to actual performance in the field, Blue Jet Chain is *completely new*.

Designed to more exacting specifications and manufactured to closer tolerances, the new Blue Jet Chain is the answer to a *faster cutting — longer wearing chain*, for every make of chain saw.

Blue Jet Chain with less maintenance and less breakage provides you with the maximum in operating economy.

You need and want the best chain . . . Blue Jet.



GUIDE LINK
Shaped for proper sprocket fit. Reamed, precision fitted rivet holes eliminate stretch.

ROUTER
Precision ground, chrome plated high grade steel means longer life, less sharpening.

SIDE LINK
Designed with ample riding area to reduce bar wear, and with precision fitted rivet holes to eliminate chain stretch.

RIVET
Large countersunk head, hardened bearing surface, precision tolerances maintain chain tightness.

ASSEMBLED
The fastest cutting, smoothest running chain on the market today.

BLUE JET CORPORATION

Hopedale, Mass., U.S.A., a Subsidiary of Draper Corporation

Journal of Forestry

Official Organ of the Society of American Foresters

How Far from a Stream Should a Logging Road Be Located?

George R. Trimble, Jr., and Richard S. Sartz
Northeastern Forest Experiment Station, Forest Service, U. S. Department of Agriculture, Upper Darby, Pennsylvania

LOGGING ROADS are one of the main causes of poor water quality in forested areas. On even the best of these roads, culverts and dips discharge sediment. But if the water that runs off the road can be filtered through the forest floor before it reaches the stream, the sediment will remain on the litter and there will be no impairment of water quality. For this to be accomplished roads must be located far enough from water courses for storm water to spread out and infiltrate the forest floor. The question is: How wide should this filtering strip be?

Though considerable information is available about the relationships of many phases of road location, construction, and maintenance to road drainage and erosion, data on the width of strip needed between road and stream to filter road runoff are nonexistent. There is, however, general recognition of the need for such a strip.

An opportunity to make some observations on sediment-discharge distance arose in the fall of 1956 on the Hubbard Brook Experimental Forest in the White Mountains of New Hampshire. The observations were made along a forest road that traverses a well-stocked northern hardwood forest of somewhat uneven-age (Fig. 1).

The terrain here is mountainous and the land surface is hummocky because of blowdowns through the centuries. This latter is a characteristic of New England forest areas that have never been cleared. The soil is a well-drained sandy loam, with some areas of impeded drainage due to hardpan. The surface is covered with a hardwood leaf litter and 2 to 5 inches of humus—largely mor but with some fine and medium mull in spots. The stand, soil, and topography are representative of the White Mountain area.

One section of this road, which had once been used for logging sleds, was opened up as a rough access road (for weir construction and watershed studies) in May 1955. An additional bulldozed section of new road was added in midsummer of 1956.

FIG. 1.—A typical section of forest road.

FIG. 2.—Open-top log culvert on one of the roads studied.

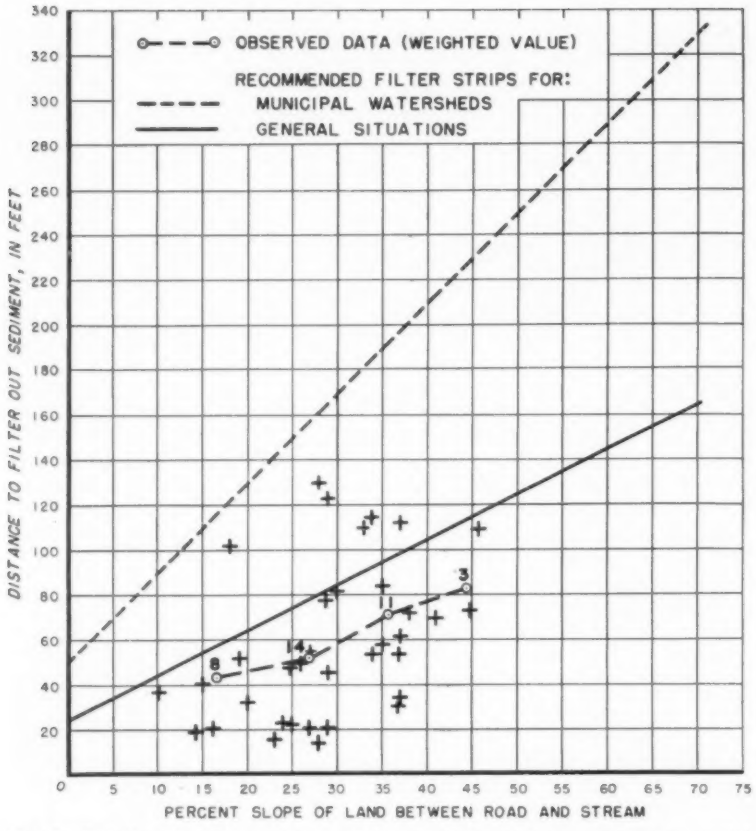


FIG. 3.—Relationship between degree of slope and the distance sediment is carried by storm runoff.

Sediment from Culverts

Both sections are drained by open-top log culverts (Fig. 2), which were installed over a period of 15 months. Spacing between culverts was fairly close; it followed roughly, for the steeper grades, this rule of thumb: Distance between drains (in feet) = 1,000 divided by road grade (in percent). Thus on a 20-percent grade, surface drains were installed at about 50-foot intervals. Maximum grades on the road are 20 percent, average grade is about 10 percent.

Parts of both roads were surfaced with a mixture of bank-run sand and gravel. The drains were already in place when this surfacing was done.

All the drains caught runoff from a series of heavy late summer rains in 1956, which provided an opportunity for observing sediment discharge from the road. At the time of measurement (October 1956) some of the drains had been in use for more than a year and some only a few months.

The distance sediment carried from the road was measured at 36 open-top log culverts. Measurements were made with a tape from the lower end of the culvert to the farthest evidence of sediment on the forest floor. The trail of sediment could be traced fairly easily.

Since steepness of slope influences the velocity of running water and its ability to transport sediment, the degree of slope below each culvert was measured with an Abney level. Forest-floor conditions (litter, humus, mineral soil) were similar along the road, so there was no opportunity to relate differences among these factors to the distance sediment was carried.

The relationship found between degree of slope and the distance sediment was carried has been plotted as a curve (Fig. 3). This provides a guide to the width of filter strip needed.

Other Factors

There are other factors besides degree of slope and soil condition that affect the distance sediment travels. While it was not possible to measure the actual effect of these factors, observations at Hubbard Brook, as well as past work, have indicated that the following are influential:

Culvert spacing.—Culverts that discharged little storm water produced little sediment, and this traveled only short distances below the outlets.

Road-surface condition.—Culverts below sections of surfaced road or in the new road section with its loose erosive surface carried considerable sediment. Where these culverts discharged a large amount of water, sediment was strung out over relatively long distances. On the other hand, culverts on the more stabilized road sections appear to have carried relatively little sediment.

Steepness of road.—The amount of material that washes from a road also varies with the steepness of the road; but in this case there was no indication that more sediment was discharged from culverts on the steeper sections. This can probably be explained by closer culvert spacing on the steep stretches, plus confounding by other variables.

Sediment trapping.—One of the most important factors that affect the distance sediment is carried is the way hollows, breaks in the grade of the slope, and slash and windthrown limbs and trees trap sediment. This is an accidental factor, without pattern under natural conditions; yet it is a normal part of the forest landscape. The amount of sediment that can be trapped by a fallen tree (Fig. 4) suggests that one might drop a tree or leave debris below culverts where a heavy flow of water is expected, to create sediment traps.

Age of culvert.—It would appear that those culverts that had

been installed longest might have strewed sediment over the greatest distances since they would presumably have been subjected to more sediment-producing storms and there would have been greater opportunity for sediment to overflow natural traps and to clog the loose surface litter. However, no obvious relationship was found here, perhaps because of confounding by other factors. This relationship is also limited by annual leaf fall: each year's leaf fall forms a fresh surface for another sediment-discharge pattern.

Application

As distances of sediment deposition may at times be greater than the maximum estimated from the observations plotted in Figure 3, the strips recommended are somewhat wider than are indicated by the data.

Recommendations are made for two kinds of situations. One is for areas where maintenance of the highest possible water quality is of paramount importance, such as in municipal watersheds. The other is for the more general situation where a little water disturbance can occasionally be tolerated. The suggestions are applicable to the location of logging roads in the White Mountain area. They may or may not apply outside this area.

Recommendations are cast as rules-of-thumb since in this form they can be more easily remembered and thus more readily used. While these rules-of-thumb are based on the general slope of the curve through the mean values in Figure 3, considerable latitude has been taken to include a safety factor and to project the recommendations beyond the limits of the data.

FIG. 4.—Sediment trapped below road by fallen tree.

For the general situation, where it is accepted that some sediment will occasionally reach a stream, the rule-of-thumb is: Starting with a strip 25 feet wide on level land, the width of strip should increase 2 feet for each 1 percent increase in slope of the land between road and stream.

For municipal watersheds, it is felt that a considerable safety factor should be included, perhaps double the recommendation for the general situation. Thus the rule-of-thumb for such areas is: Starting with a strip 50 feet wide on level land, the width should increase 4 feet for each 1-percent increase in slope of the land between road and stream. Strip widths as determined by the rules-of-thumb are plotted as straight lines in Figure 3. They are also shown in Table 1.

TABLE 1.—RECOMMENDED WIDTHS FOR FILTER STRIPS

Slope of land between road and stream	Width of filtration strip[1]	
	Municipal watershed	General situation
Percent	*Feet*	*Feet*
0	50	25
10	90	45
20	130	65
30	170	85
40	210	105
50	250	125
60	290	145
70	330	165

[1]From lower edge of disturbed area, road, or toe slope, to stream.

These suggestions for width of strips between road and stream are based on the data plotted in Figure 3. Since the actual data are limited in range to slopes between 10 and 46 percent, the suggested strip widths outside of this range are based on extrapolation.

Browse Quality and the Effects of Prescribed Burning in Southern Pine Forests[1]

Daniel W. Lay[2]
Wildlife biologist,
Texas Game and Fish Commisison,
Buna

PRESCRIBED BURNING and deer and livestock numbers are increasing in southern pine forests. In silviculture, burning is an important tool for the control of hardwoods to favor pines. Deer and livestock management in the forests is a major land-use problem.

The soils in southern pine forests are generally low in fertility and the forage produced on them is low in quality. Fertilization and seeding of tame pastures, or supplementary feeding in fall and winter, is necessary for good calf crops and heavy milk or beef production. Deer consume little grass, but cattle and deer complete for herbs and palatable browse species. Available information suggests that the nutrition problems of deer are similar to those of cattle. Quality deficiencies of the range limit the production of both.

The present report covers an analysis of browse forage collected quarterly, 1954 and 1955, on burned and unburned parts of the Siecke State Forest. The area, located in Newton County, Texas, is formerly a longleaf pine site protected from grazing and fire for over 15 years. Now it is essentially a pine-hardwood type, with nearly full stocking of pole-size loblolly pine. Rainfall in 1953 was 65.31 inches; in 1954, it was 41.85 inches; the normal rainfall is 53.84 inches.

Methods of Study

Collections of plant samples were made on three burns and on adjacent unburned areas. The October 1953 and the April 1954 burns were the first in over 15 years. The December 1953 area had been burned two years before for the first time in more than 15 years. Burning was by personnel of the Texas Forest Service.

Samples were dried immediately at 150 degrees F. with forced draft. Analysis was made in the office of State Chemist J. F. Fudge by A.O.A.C. methods (*1*). Sample size ranged from 50 to 100 grams of the dried material and each was a composite of material from at least 10 and often 20 plants. Samples consisted of two-inch tips or less of all woody species except that four-inch tips of muscadine and greenbrier were used. Only current season growth was taken. The distal half of grasses and herbs was clipped. All samples were collected below the forest canopy.

Analyses were adjusted to the level of 15 percent moisture, which is standard for air-dry forage. Phosphorus is presented in terms of phosphoric acid (P_2O_5), and may be converted to phosphorus (P) by multiplying by 0.4368. Analysis of variance was made by the Statistical Laboratory of the Texas Agricultural Experiment Station.

Ten of the 28 species sampled were replicated for four seasons and four treatments as a measure of fire effects on browse. They were selected as common and at least fairly palatable species. These were sweetleaf, yaupon, tree huckleberry, dogwood, water oak, sassafras, sweetgum, viburnum, muscadine, and French mulberry. Scientific names are given in Table 1, together with results.

[1]A contribution of Texas Federal Aid in Wildlife, Project W-63-R.

[2]Appreciation is expressed for the assistance and cooperation of the Texas Forest Service and to foresters Mason Cloud and Ted Silker; and to Dr. J. F. Fudge, Robert Smith, and John Wood of the Texas Agricultural Experiment Station.

TABLE 1.—NUTRIENT CONTENT OF SPECIES BY DATE AND BURNING HISTORY AT 15 PERCENT MOISTURE LEVEL

Species	Date[1]	Burn History[2]	Percent Air Dry	Protein	Fat	Fiber	N-Free Extract	Ash	Phosphoric Acid	Calcium
(Ascyrum stans)	W	no	47.5	7.74	4.25	17.65	52.82	2.54	0.20	0.56
(Berchemia scandens)	Su	no	43.4	7.11					0.14	
Rattan	W	no	56.6	5.15	1.20	34.22	41.88	2.55	0.10	1.00
(Callicarpa americana)	Sp	no	25.0	18.24	5.35	14.24	43.92	3.25	0.45	0.50
French Mulberry	Sp	1	19.7	22.38	5.03	13.00	38.98	5.60	0.74	0.42
	Su	no	29.4	11.60	7.39	15.68	43.62	6.72	0.21	0.99
	Su	1	26.4	14.74	7.88	13.45	42.89	6.04	0.33	0.85
	Su	2	30.2	11.33					0.28	
	Su	3	23.8	14.95					0.36	
	F	no	33.2	8.07	6.38	15.52	48.30	6.73	0.18	1.47
	F	1	37.1	10.61	7.51	14.33	46.00	6.55	0.21	1.45
	W	no	61.4	4.55	1.46	32.97	43.38	2.64	0.13	0.56
	W	1	60.9	5.37	1.21	31.10	44.78	2.54	0.20	0.51
	W	2	67.9	6.08	1.27	30.42	44.75	2.48	0.16	0.58
	W	3	62.4	5.97	1.40	31.89	43.09	2.66	0.13	0.43

[1]Code for date collected: Sp—April 12, 1954; Su—July 20, 1954; F—October 12, 1954; and W—January 16, 1955.
[2]Code for burning history: no—unburned; 1—burned Oct. 1953; 2—burned Dec. 1953; and 3—burned April 1954.

TABLE 1.—NUTRIENT CONTENT OF SPECIES BY DATE AND BURNING HISTORY AT 15 PERCENT MOISTURE LEVEL (Contd.)

Species	Date	Burn history	Percent air dry	Protein	Fat	Fiber	N-Free extract	Ash	Phosphoric acid	Calcium
(Cornus florida)	Sp	no	29.3	10.26	3.82	13.54	51.22	6.16	0.29	2.04
Dogwood	Sp	1	30.7	13.92	2.45	10.14	51.32	7.16	0.44	2.15
	Su	no	37.2	6.49	5.61	13.61	51.57	7.72	0.17	2.76
	Su	1	35.0	7.07	3.83	11.21	55.56	7.33	0.18	2.42
	Su	2	33.5	8.50					0.18	
	Su	3	29.7	7.68					0.24	
	F	no	44.0	5.62	6.84	15.82	48.41	8.31	0.14	2.90
	F	1	39.3	6.07	5.20	12.36	53.89	7.49	0.17	2.78
	W	no	43.3	4.49	4.30	21.85	48.23	6.13	0.17	2.01
	W	1	42.0	5.16	3.98	23.48	46.86	5.52	0.17	1.75
	W	2	45.6	5.50	4.18	18.07	52.65	4.60	0.17	2.03
	W	3	41.6	6.21	4.69	16.81	49.11	8.18	0.17	2.80
(Cyrilla racemiflora)	Su	no	35.9	6.96					0.11	
Ti-ti	W	no	44.8	4.99	4.64	20.64	52.73	2.00	0.10	0.56
(Fraxinus americana)	Su	no	38.2	7.91					0.17	
Ash	W	no	68.5	3.47	0.95	37.56	40.90	2.12	0.15	0.74
(Gelsemium sempervirens)	Su	no	35.6	7.46					0.15	
Yellow jessamine	W	no	35.2	7.17	8.51	15.72	50.97	2.63	0.14	0.46
(Helianthus angustifolius)	Su	no	17.1	7.75					0.18	
Swamp Sunflower										
(Ilex coriacea)	Su	no	45.0	5.46					0.15	
Gallberry	W	no	53.9	5.08	7.14	15.67	54.62	2.49	0.10	0.46
(Ilex opaca)	Su	no	42.4	5.50					0.14	
Holly	W	no	50.9	6.73	3.16	26.10	46.17	2.84	0.14	0.70
(Ilex vomitoria)	Sp	no	33.1	9.36	3.09	17.33	46.34	8.88	0.25	0.27
Yaupon	Sp	1	26.4	14.84	2.73	12.52	50.83	4.07	0.43	0.23
	Su	no	40.3	8.71	3.12	26.69	42.40	4.07	0.17	0.38
	Su	1	36.3	10.43	4.05	15.47	51.00	4.05	0.21	0.31
	Su	2	36.2	10.00					0.21	
	Su	3	27.1	16.33					0.34	
	F	no	46.0	8.85	3.67	21.85	46.34	4.28	0.15	0.62
	F	1	44.4	7.60	3.63	25.39	45.08	3.31	0.16	0.36
	W	no	53.9	6.94	4.84	21.62	48.53	3.07	0.16	0.41
	W	1	48.4	9.81	4.01	16.91	50.91	3.36	0.19	0.38
	W	2	53.0	10.06	3.11	19.59	49.29	2.94	0.16	0.22
	W	3	45.6	11.26	3.16	18.65	48.59	3.33	0.20	0.26
(Liquidambar styraciflua)	Sp	no	25.6	10.76	2.78	9.08	58.49	3.89	0.32	0.63
Sweetgum	Sp	1	23.3	13.01	2.32	8.44	57.05	4.18	0.51	0.41
	Su	no	33.9	7.00	2.78	12.09	59.39	3.73	0.17	0.86
	Su	1	28.9	9.18	3.15	12.94	55.74	4.00	0.22	0.71
	Su	2	34.7	9.14					0.20	
	Su	3	23.2	11.07					0.31	
	F	no	37.7	5.74	3.09	11.08	59.77	5.33	0.14	1.28
	F	1	36.0	8.38	2.66	10.72	58.35	4.88	0.20	1.05
	W	no	46.9	4.42	2.51	20.23	54.64	3.21	0.15	1.70
	W	1	38.7	6.06	2.44	19.80	52.67	4.04	0.18	1.51
	W	2	45.9	5.12	2.11	25.74	48.77	3.26	0.18	1.30
	W	3	35.6	6.11	2.73	15.17	55.00	6.00	0.17	1.50
(Magnolia virginiana)	Su	no	37.8	10.67					0.18	
White bay	W	no	43.2	9.44	7.52	22.13	40.59	5.32	0.20	0.79
Mixed grasses, before seeding	Su	no	37.3	6.59					0.13	
(Myrica cerifera)	Su	no	40.1	9.73					0.13	
Wax myrtle	W	no	49.5	9.45	5.22	17.34	49.56	3.43	0.12	1.45
(Nyssa sylvatica)	Su	no	33.0	7.64					0.17	
Black gum	W	no	53.0	3.19	2.33	32.84	44.01	2.63	0.12	1.10
(Persea borbonia) Red Bay	W	no	53.7	6.98	3.25	29.50	43.10	2.17	0.14	0.31
(Pinus taeda)	Su	no	34.3	5.90					0.17	
Loblolly Pine	W	no	46.5	7.11	7.16	21.46	46.95	2.32	0.20	0.24
(Quercus alba) White oak	W	no	66.0	3.89	1.46	34.22	42.43	3.00	0.13	1.67

TABLE 1.—NUTRIENT CONTENT OF SPECIES BY DATE AND BURNING HISTORY AT 15 PERCENT MOISTURE LEVEL (Contd.)

Species	Date	Burn history	Percent air dry	Protein	Fat	Fiber	N-Free extract	Ash	Phosphoric acid	Calcium
(Quercus nigra) Water oak	Sp	no	33.4	10.05	2.81	24.93	39.40	7.81	0.28	0.41
	Sp	1	35.7	10.04	1.94	22.65	47.09	3.28	0.33	0.40
	Su	no	51.5	7.57	2.79	28.74	42.62	3.28	0.15	0.82
	Su	1	45.0	7.48	2.15	26.36	46.03	2.99	0.17	0.67
	Su	2	44.5	7.18					0.16	
	Su	3	40.8	8.93					0.21	
	F	no	53.4	6.64	2.55	27.30	45.04	3.47	0.15	0.98
	F	1	51.7	7.55	2.53	23.54	47.98	3.40	0.15	0.83
	W	no	53.0	7.24	2.83	24.67	46.99	3.27	0.15	0.93
	W	1	54.1	7.16	7.16	24.60	42.96	3.12	0.16	1.01
	W	2	59.5	6.73	2.89	23.97	48.64	2.77	0.13	0.74
	W	3	56.6	6.46	2.61	23.25	48.97	3.72	0.13	1.08
(Sassafras albidum) Sassafras	Sp	no	24.8	14.66	3.39	15.18	48.37	3.40	0.46	0.50
	Sp	1	20.0	19.83	2.29	11.62	46.33	4.92	0.65	0.42
	Su	no	35.4	9.10	5.71	17.48	48.63	4.07	0.18	1.11
	Su	1	31.9	11.11	4.10	13.26	52.76	3.78	0.27	0.45
	Su	2	35.6	10.62					0.22	
	Su	3	25.0	12.88					0.38	
	F	no	42.9	7.70	6.74	14.56	52.63	3.38	0.17	1.07
	F	1	41.3	8.00	6.49	13.19	53.96	3.36	0.17	0.81
	W	no	56.5	3.96	2.76	31.80	44.73	1.76	0.14	0.56
	W	1	57.4	4.61	2.66	33.68	42.31	1.75	0.15	0.51
	W	2	61.3	4.14	2.20	35.51	41.54	1.62	0.13	0.55
	W	3	58.7	4.71	2.32	34.77	41.00	2.21	0.15	0.52
(Smilax glauca) Greenbrier	Su	no	32.8	8.36					0.16	
	W	no	45.5	8.49	4.91	19.54	48.96	3.11	0.17	0.93
(Smilax smallii) Greenbrier	Su	no	30.3	11.52					0.16	
	W	no	41.8	12.79	5.17	22.43	41.26	3.40	0.23	1.05
(Symplocos tinctoria) Sweetleaf	Sp	no	16.2	16.77	2.40	15.64	42.02	8.16	0.50	0.45
	Sp	1	17.4	19.98	2.22	12.27	42.15	8.37	0.64	0.53
	Su	no	25.4	12.18	3.65	14.04	46.38	8.75	0.21	0.63
	Su	1	21.0	10.95	2.14	12.79	50.05	9.08	0.21	0.47
	Su	2	24.4	10.94					0.21	
	Su	3	23.8	15.28					0.38	
	F	no	35.9	7.96	7.52	12.69	47.97	8.86	0.14	0.69
	F	1	30.1	8.86	8.03	14.63	46.44	7.05	0.17	0.61
	W	no	32.7	7.91	10.47	12.60	45.96	8.06	0.15	0.55
	W	1	31.5	9.49	7.36	13.55	47.12	7.47	0.20	0.49
	W	2	34.9	9.47	6.32	13.63	49.09	6.50	0.20	0.45
	W	3	31.7	10.78	3.14	12.39	51.30	7.39	0.22	0.30
(Tephrosia onobrychoides) Goat's rue	Su	no	41.0	9.60					0.12	
(Vaccinium arboreum) Tree huckleberry	Sp	no	26.4	9.75	3.93	25.46	40.47	5.39	0.23	0.39
	Sp	1	22.9	13.25	7.85	13.78	47.37	2.75	0.37	0.32
	Su	no	37.8	6.65	4.45	22.46	48.19	3.24	0.15	0.87
	Su	1	32.0	7.50	4.13	17.01	53.52	2.84	0.18	0.52
	Su	2	34.6	7.17					0.17	
	Su	3	22.9	11.13					0.32	
	F	no	41.0	6.64	4.66	21.27	48.43	4.00	0.12	1.11
	F	1	45.5	6.29	4.80	20.73	49.75	3.42	0.14	0.79
	W	no	48.2	5.31	4.51	26.15	45.60	3.44	0.14	1.01
	W	1	42.9	6.63	4.07	22.19	47.94	4.16	0.20	0.91
	W	2	49.3	5.51	4.07	23.85	48.38	3.18	0.14	0.78
	W	3	44.2	6.35	2.96	21.88	50.44	3.38	0.15	0.61
(Virbunum molle)	Sp	no	26.3	11.50	4.53	16.90	47.09	4.98	0.41	0.57
	Sp	1	26.7	12.27	4.17	13.60	49.43	5.53	0.47	0.49
	Su	no	33.5	7.23	5.01	17.79	48.99	5.97	0.20	1.22
	Su	1	38.2	6.18	5.91	15.32	52.90	4.70	0.20	0.78
	Su	2	35.4	7.71					0.21	
	Su	3	24.1	11.55					0.35	
	F	no	42.4	6.55	7.76	13.92	52.02	4.75	0.19	1.19
	F	1	41.8	6.79	7.25	13.88	52.43	4.65	0.17	1.11
	W	no	51.7	3.64	4.50	26.33	47.66	2.87	0.15	0.85
	W	1	46.6	3.97	4.93	25.90	47.19	3.00	0.15	0.93
	W	2	49.7	4.42	6.57	22.96	48.29	2.77	0.15	0.77
	W	3	39.4	5.87	6.30	16.39	52.56	3.88	0.16	1.04

TABLE 1.—NUTRIENT CONTENT OF SPECIES BY DATE AND BURNING HISTORY AT 15 PERCENT MOISTURE LEVEL (Contd.)

Species	Date	Burn history	Percent air dry	Protein	Fat	Fiber	N-Free extract	Ash	Phosphoric acid	Calcium
(*Vitis rotundifolia*)	Sp	no	29.7	11.78	1.79	12.70	54.57	4.16	0.29	0.81
Muscadine	Sp	1	26.9	13.16	1.66	10.32	55.07	4.79	0.40	0.74
	Su	no	38.4	7.53	4.32	15.58	54.00	3.58	0.17	1.82
	Su	1	34.8	7.85	3.22	16.53	53.05	4.35	0.23	1.06
	Su	2	34.5	7.88					0.22	
	Su	3	28.1	10.26					0.30	
	F	no	49.3	5.52	7.14	18.71	49.37	4.26	0.17	1.52
	F	1	41.6	7.73	4.29	12.12	57.56	3.31	0.19	1.27
	W	no	54.3	3.85	1.07	32.22	45.41	2.45	0.14	0.74
	W	1	56.3	3.81	1.05	33.67	44.03	2.42	0.14	0.69
	W	2	58.2	4.46	0.91	31.03	45.74	2.86	0.15	0.66
	W	3	53.7	4.16	1.16	33.96	42.70	3.02	0.15	0.87

Nutrient Values

The analyses of 25 unburned browse species in summer and winter, and 10 species in spring and fall, show that the average crude protein level is 12.31 percent in spring, 8.10 percent in summer, 6.93 percent in fall, and 6.16 percent in winter. The phosphoric acid content was 0.35 percent in spring, 0.16 percent in summer and fall, and 0.15 percent in winter.

By the grade standards described by Fraps and Fudge (*3*), the protein level is good in spring, fair in summer, and low-fair in fall and winter. The phosphoric acid level is fair in spring but very deficient during the balance of the year. Calcium grades were good in spring and high during the remainder of the year.

These nutrient records for browse compare very favorably with those for grasses. Campbell *et al* (*2*) reported on the composite cattle diet on forest range in central Louisiana. On an air-dry basis, the percentages of protein were 10.62 in spring, 6.61 in summer, 5.40 in fall, and 3.92 in winter. Thus, browse was superior every season. The percentages of phosphoric acid in the cattle diet were 0.25 in spring, 0.23 in summer, 0.18 in fall, and 0.09 in winter. Browse was therefore superior in phosphorus content in spring and winter. The cattle diet in question was 1.2 percent browse, 4.0 percent weeds, and 94.8 percent grasses.

The composite winter diet of three deer in a 58-acre pen at the Siecke State Forest was 5.95 percent protein, 0.13 phosphoric acid, and 0.50 calcium, which again reflects the superiority of the browse diet under consideration.

In some woodland pastures cattle make heavy use of certain browse species, in competition with deer, and the basis for such competition is probably the superior quality or palatability of the browse species involved. Evergreens are more nutritious in winter than deciduous species and, except for pine and wax myrtle, they are generally palatable. Carrying capacity for deer and cattle appears to be correlated with the amount of acceptable evergreen species present. As pine stand improvement practices progressively reduce the acorn supply, the importance of palatable evergreens to deer increases.

Effects of Burning

The effects of burning were studied in three parts, using the same 10 species, all of which are common in the forest composition. The principal part was an analysis of variance of burned and unburned samples for four seasons on an October burn. A second analysis was made with January collections on three burns, aged 9, 13, and 15 months. A third analysis, involving the same three burns, was made for protein and phosphoric acid at the July and January levels.

The effects of burning on *quality* of browse were generally beneficial. Percentage changes for 7 nutrients and 8 collections on 3 burns are shown in Table 2. Maximum increases were on the April burn as reflected in July collections, 42.8 percent more protein and 77.8 percent more phosphoric acid were recorded.

Increases in protein were the most enduring. The October burn showed 18.7 percent more protein the second winter after burning, and April burn showed 29.8 percent more protein the first winter after burning. The same January collection for these two burns likewise showed 17.6 and 10.1 percent more phosphoric acid.

Species reaction to burning varied as shown in Table 3. Species (among the 10) with the greatest nutrient changes after burning were yaupon, sweetgum, and French mulberry. Those with the least change were water oak, muscadine, and viburnum.

Moisture content changes with the season and burning appears to increase it slightly, as shown in Table 4.

TABLE 2.—PERCENTAGE OF DIFFERENCE IN NUTRIENT CONTENT OF TEN SPECIES ON THREE BURNS COMPARED WITH UNBURNED AREAS

Date Collected	Date Burned	Protein	Fat	Fiber	N-Free Ext.	Ash	Acid Phos.	Calcium
April 1954	October 1953	24.0	— 3.5	—22.2	2.9	— 9.6	36.8	— 7.5
July 1954	October 1953	10.1	— 9.4	—16.2	5.7	— 3.7	23.6	—28.7
	December 1953	7.5					15.7	
	April 1954	42.8					77.8	
October 1954	October 1953	11.9	— 6.9	— 6.8	2.6	—11.2	11.6	—13.8
January 1955	October 1953	18.7	— 0.7	— 2.2	—0.9	1.3	17.6	— 6.4
	December 1953	17.6	—14.3	— 2.2	1.3	—10.6	6.1	—12.9
	April 1954	29.8	—22.2	0.3	2.5	18.7	10.1	1.1

TABLE 3.—SPECIES REACTION TO FIRE AS INDICATED BY MEAN DIFFERENCE IN NUTRIENT CONTENT OF BURNED AND UNBURNED AREAS OF BROWSE FOR THREE BURNS AT FOUR SEASONS

Species	Protein	Phosphoric acid	Calcium
Sweetleaf	1.34	.064	—.095
Yaupon	3.15	.064	—.123
Tree huckleberry	1.44	.056	—.261
French mulberry	2.08	.095	—.066
Dogwood	1.16	.034	.033
Water oak	0.05	.014	—.045
Sassafras	1.79	.066	—.183
Sweetgum	2.16	.061	—.235
Viburnum molle	1.01	.029	—.068
Muscadine	0.10	.046	—.180

Quarterly analyses for the October burn and the variance test are shown in Table 5, indicating that burning very significantly (at the 0.01 level) affected crude protein, crude fiber, N-free extract, and calcium. The effects of burning were significant at the 0.05 level on phosphoric acid.

The effects of season were significant on all nutrients, as were the effects of species, with the exception of phosphoric acid. Interaction of treatment and date was very significant for protein and calcium; and interaction of date and species was very significant for protein, fat, and fiber.

In the January collections on three burns, burning increased protein and ash at the 0.01 level of probability and phosphoric acid at the 0.05 level.

The inclusion of the July data with the January data on protein and phosphoric acid for the three burns produced highly probable (0.01 level) indications that both nutrients were increased by the treatment. Date, species, treatment-and date interaction, and date-and-species interaction were also highly significant.

Conclusions

Forage quality appears to be a more important limiting factor on year-around carrying capacity than forage quantity. Phosphorus levels are most critical, being inadequate except in spring. Protein levels are inadequate in fall and winter. The nutrient quality of browse appears to be generally better than that of herbaceous forage, which may explain the browsing by cattle in woodland and consequent competition with deer.

Burning at any season increases the protein and phosphoric acid content of browse, but most of the benefits disappear within a year or two, or before burning can be repeated under good silvicultural practice. Spring burns, range quality considered, are better than fall or winter burns; summer burning probably would be equally good. To improve forage quality, burning in spring or summer as frequently as good forestry permits is indicated.

Burning effects on forage quantity were not serious after three fires at 2- or 3-year intervals, as reported previously by Lay (*4*). Where mast of understory species is important, burning may be harmful since there was a 70 percent reduction in yield. Long term re-

TABLE 4.—AVERAGE PERCENT AIR DRY FORAGE IN GREEN BROWSE FOR TEN SPECIES BY DATE AND BY BURNING HISTORY

Date collected	Unburned	Burned Oct. 1953	Burned Dec. 1953	Burned April 1954
April 1954	26.98	24.97	—	—
July 1954	36.28	32.95	34.36	26.85
October 1954	42.58	40.88	—	—
January 1955	50.19	47.88	52.53	46.95

TABLE 5.—AVERAGE COMPOSITION OF TEN SPECIES UNBURNED AND BURNED OCTOBER 1953 FOR FOUR SEASONS APRIL 1954 TO JANUARY 1955

Nutrient	Unburned				Burned October 1953			
	April	July	Oct.	Jan.	April	July.	Oct.	Jan.
Protein	12.31	8.41	6.93	5.23	15.27	9.25	7.79	6.21
Fat	3.39	4.48	5.63	3.92	3.27	4.06	5.24	3.89
Fiber	16.50	18.42	17.27	25.04	12.83	15.43	16.09	24.49
N-Free Extract	47.19	48.58	49.83	47.11	48.56	51.35	51.14	46.68
Ash	5.61	5.11	5.34	3.69	5.06	4.92	4.74	3.74
Phosphoric Acid	0.348	0.178	0.155	0.148	0.498	0.220	0.173	0.174
Calcium	0.657	1.146	1.283	0.932	0.611	0.824	1.106	0.869

ANALYSIS OF VARIANCE

Source	Degrees of freedom	Mean square						
		Protein	Fat	Fiber	N-F Ext.	Ash	Phos. acid	Calcium
Total	79							
Treatment	1	39.66[2]	1.21	87.91[2]	31.55[2]	2.07	0.0696[1]	0.4621[2]
Date	3	242.77[2]	15.85[2]	396.74[2]	57.88[2]	10.46[2]	0.3142[2]	1.0764[2]
Species	9	25.11[2]	8.85[2]	107.11[2]	115.97[2]	20.39[2]	0.0117	2.3511[2]
Treat. X Date	3	5.33[2]	0.11	10.75	8.63	0.46	0.0188	0.0810[2]
Treat. X Species	9	1.50	1.13	5.16	8.00	0.79	0.0021	0.0138
Date X Species	27	5.90[2]	5.61[2]	35.07[2]	12.09[1]	1.78	0.0055	0.1152
Remainder	27	0.8007	0.9308	4.1691	4.8150	0.9444	0.0016	0.0096

[1]Exceeds the 5 percent level of probability.
[2]Exceeds the 1 percent level of probability.

TABLE 6.—EFFECTS OF THREE BURNING DATES ON AVERAGE COMPOSITION OF TEN SPECIES IN JANUARY 1955

Nutrient	Unburned	Oct. 1953 burn	Dec. 1953 burn	April 1954 burn
Protein	5.23	6.21	6.15	6.79
Fat	3.92	3.89	3.36	3.05
Fiber	25.04	24.49	24.48	22.52
N. F. Ext.	47.11	46.68	47.71	48.28
Ash	3.69	3.74	3.30	4.38
Phosphoric Acid	0.148	0.174	0.157	0.163
Calcium	0.932	0.869	0.808	0.941

ANALYSIS OF VARIANCE

Source	DF	Mean Square						
		Protein	Fat	Fiber	N.F. Ex.	Ash	Phos. acid	Calcium
Total	39							
Treatment	3	4.14[2]	1.81	12.30	4.88	1.99[2]	.0011[1]	.0383
Species	9	15.34[2]	12.96[2]	180.78[2]	37.79[1]	11.51[2]	.0011[2]	1.2319[2]
Remainder	27	.4432	1.6149	5.7169	4.3548	.3587	.0003	.0324

[1]Exceeds the 5 percent level of probability.
[2]Exceeds the 1 percent level of probability.

Table 7.—Effects of Three Burns on Protein and Phosphoric Acid in July and January

Treatment	July 1954 Protein	July 1954 Phosphoric acid	January 1955 Protein	January 1955 Phosphoric acid
Unburned	8.41	.178	5.23	.148
Burned Oct. 1953	8.25	.220	6.21	.174
Burned Dec. 1953	9.05	.206	6.15	.157
Burned April 1954	12.01	3.19	6.79	.163

Analysis of Variance

Source of variation	DF	Mean square: Protein	Mean square: Phosphoric acid
Total	79		
Treatment	3	23.54[2]	.0221[2]
Date	1	256.79[2]	.0987[2]
Species	9	23.53[2]	.0032[2]
Treatment X Date	3	6.00[2]	.0166[2]
Treatment X Species	27	1.18[1]	.0007
Date X Species	9	9.12[2]	.0029[2]
Remainder	27	.5858	.0004

sults of repeated burning at short intervals would be detrimental to the browse supply and to deer.

In addition to burning as a method of improving browse quality, the use of phosphate fertilizers is indicated where practicable. Also, any measure that served to increase the production of palatable evergreens would have the effect of improving the quality level of the diet.

Summary

Analyses of 25 unburned browse species in eastern Texas showed the protein content to be about 12 percent in spring, 8 percent in summer, 7 percent in fall, and 6 percent in winter. The phosphoric acid content was 0.35 percent in spring and 0.15 to 0.16 percent during the remainder of the year. These levels are low for protein in fall and winter, and deficient for phosphoric acid in summer, fall, and winter.

Winter is the most critical dietary period for game, and phosphoric acid is the most critical nutrient; yet, in winter in this region, levels of browse are above those of herbaceous forage, accounting in a logical way for the competition between cattle and deer for browse during the winter months.

Burning increased protein content as much as 42.8 percent and phosphoric acid content as much as 77.8 percent in the species involved, but most of the benefits disappeared within a year or two. More permanent improvement in the quality of the fall and winter diet is needed to achieve maximum carrying capacity. Increased production of palatable understory evergreens would give this effect, and probably represents the most practical means of attaining such improvement.

Literature Cited

1. Association of Official Agricultural Chemists. 1945. Official and tentative methods of analysis. Washington, D. C.
2. Campbell, Robert S., E. A. Epps, Jr., C. C. Moreland, J. L. Farr, and Frances Bonner. 1954. Nutritive values of native plants on forest range in central Louisiana. La. State Univ. and A & M Col. Agric. Expt. Sta. La. Bul. No. 488, 18 pp.
3. Fraps, G. S. and J. F. Fudge. 1940. The chemical composition of forage grasses of the east Texas timber country. Tex. Agric. Expt. Sta. Bul. No. 582. 35 pp.
4. Lay, Daniel W. 1956. Effects of prescribed burning on forage and mast production in southern pine forests. Jour. Forestry 54:582-584.

Over 2 Million Acres of Insect and Disease Infested Timberland Treated in '56

The Forest Service spearheaded a fight against insects and tree diseases on more than 2 million acres of forest land in 1956, the U. S. Department of Agriculture announced today.

Working with the Forest Service on these jobs were the Department of the Interior, state forestry agencies, and private landowners. Together, they treated 692,798 acres against blister rust. They hand sprayed 304,792 trees against bark beetles and used planes to spray 1,366,900 acres of timbered land infested with budworm. In addition, they waged war on miscellaneous insects and diseases on 98,900 acres.

The control of blister rust involved the destruction of 12 million wild currant and gooseberry bushes of the ribes family. Most bushes are pulled by hand. This year, however, toxic chemicals were sprayed on 10,780 acres where the ribes were concentrated or the plants were too large for grubbing.

With some 4 to 5 million acres yet to be rid of ribes, Forest Service field units are continuously trying out different means of control. Some 3,500 high-quality sugar pine trees on California were saved by pruning blister rust cankers from them.

Young western white pines bred by blister rust resistant parents proved immune to the disease when planted in Montana and northern Idaho. Plans have been made to breed more such trees for planting.

The main fight against blister rust is concentrated in the northern Rocky Mountains. It is also carried on in the Northeast, the Lake States, and the States along the Pacific Coast.

The 1956 aerial spraying of the spruce budworm was largely on seriously infested areas of Montana, Idaho, and New Mexico. Although substantial, this year's control work did not cover all infested forests.

Bark beetle infestations, which are fought by hand spraying of individual trees, were found largely in Colorado, Montana, and the southeastern states.

The Forest History Foundation, Inc.

Elwood R. Maunder
Director, Forest History Foundation, Inc., St. Paul, Minnesota

THE FOREST HISTORY FOUNDATION, INC., is a nonprofit, tax-exempt, educational organization established to collect, preserve, and disseminate the history of North American forests and all forest-related activities.

The Foundation was first conceived in 1945 by Dr. Theodore C. Blegen, dean of the graduate school of the University of Minnesota, and Dr. August C. Krey, then chairman of the history department at the same institution. These two men recognized in their own studies of Minnesota history a great lack of authentic source materials documenting the history of the forest products industries, forestry, conservation, and other subjects related to the forests of the state. They took their ideas to the late F. E. Weyerhaeuser, prominent Saint Paul lumberman, concerning how these resources could be found, processed for use by scholars, and preserved as an important part of their region's heritage. Mr. Weyerhaeuser showed keen interest in testing the idea and agreed to sponsor an investigation of the sources of forest products history in the United States. Mr. Weyerhaeuser's death late in 1945 prevented him from having a part in the launching of the project. This role fell to his nephew, Fred K. Weyerhaeuser, who took the lead in setting up in 1946 the Forest Products History Foundation as a special project of the Minnesota Historical Society.

Dr. Rodney C. Loehr, associate professor of economic history at the University of Minnesota, was put in charge of the experiment. He organized a staff of part-time assistants drawn from the ranks of graduate students in history, began to develop techniques, and sought first-hand acquaintance with the forest industries.

Dr. Loehr early set forth the Foundation's work in terms of functions which he and his colleagues would seek to perform: (1) the preparation of bibliographic aids and guides to printed materials and manuscript collections; (2) the collection and preservation of records; (3) research; (4) publication; and (5) to act as a national research center and coordinating agency. Dr. Loehr deserves much thanks for the fine work which he did, much of it under difficult conditions, in laying the groundwork for a program which has gone on to accomplishments in all five of the areas defined in 1947.

However, in 1950 Dr. Loehr resigned as director of the Foundation and returned to full-time teaching. During the next two years the Forest Products History Foundation continued to exist but one by one members of the staff left for other academic pursuits. Only the faith of the few men who had originally conceived the project kept it from being abandoned. In 1952, they recruited new financial support from a small group of Minneapolis and St. Paul businessmen, and the project was reactivated under the direction of Elwood R. Maunder.

The following year, in line with the Foundation's broadening program which included continent-wide search for historical records, increased emphasis on the history of forestry and conservation, and solicitation of support from the entire forest products industry, the name was changed to the American Forest History Foundation. Two years later when the governing body agreed unanimously to incorporate the project as an independent enterprise under the nonprofit corporation act of the State of Minnesota, it became the Forest History Foundation.

The Foundation is sponsored by some 150 companies or individuals most of whom are connected with the forest products industries. It is governed by a Board of Directors comprised of businessmen, foresters, historians, an editor, and an archivist. The officers consist of a president, first and second vice presidents, secretary and director, assistant secretary, treasurer, and assistant treasurer. Dr. Frank H. Kaufert, director of the School of Forestry of the University of Minnesota, is currently president. Standing committees—executive, research, publishing, repositories, organization, and finance—supervise the functions of the Foundation.

To honor persons distinguished for their literary, scientific, or philanthropic contributions to the field of forest history, the Board annually elects Fellows of the Forest History Foundation. Four Fellows have been elected: Samuel Trask Dana, Dard Hunter, and posthumously, Colonel William B. Greeley and F. E. Weyerhaeuser.

The purposes of the Foundation have continued to be essentially those laid down by Dr. Loehr. The greatest emphasis, however, has been placed on collection and preservation of records as the basic purpose without which the others cannot exist. From the beginning the Foundation has recognized the principle that historical materials belong to the region to which they relate, for there they will be most useful and most meaningful. The Foundation has never attempted to set up a single great central collection of records in St. Paul, Minnesota; rather it has sought to act as an agent finding the records and then channeling them to appropriate repositories. To implement this function, the Foundation has, since 1954, organized a number of state and provincial committees

on forest history. To membership on these committees it has invited members of the faculties of many of the leading colleges and universities, archivists, librarians, foresters, conservationists, writers, editors, businessmen, and others who have evidenced serious interest in collecting and preserving the forest history of their region. These groups have become the spearheads of a mounting collecting and preserving program.

In the western states of Arizona, California, Oregon, and Washington, and in the province of British Columbia, functioning committees on forest history now serve as scouts and advocates of a network of 14 of the top collecting institutions in their region. Mississippi has a forest history committee, and during the spring of 1957 the Foundation expects to hold organizational meetings in Pennsylvania, Washington, D. C., Minnesota, and possibly North Carolina. Hundreds of cubic feet of records have already been located and placed in suitable libraries and archives through the efforts of committee members. Committee members have been instrumental in pointing out areas of forest history which need study. Two such projects recently begun at the University of Oregon are a Ph.D. thesis on the 4L movement in the western lumber industry, and an M.A. thesis on the early career of Colonel Greeley.

Currently under consideration is a proposed two-year study of the effects of forest fires in western United States and Canada, and of cooperative efforts to control or prevent them. Records documenting this history have been sought for and located by Foundation staff and committee members during the past two years. Early in December the Board of Directors recommended that the project be undertaken as soon as possible. The Foundation has already located a professional historian and a forester of more than forty years' experience in this particular field who will cooperatively begin the work as soon as money to support it can be raised. It has been suggested by the western committees that the project be made a memorial to Colonel William B. Greeley. It seems logical that any serious study in the history of fire prevention should be initiated in the West where the first cooperative efforts to combat the fire menace were made, and where the first scientific studies of the problem were carried out. The Foundation hopes this will be the pilot study in a series designed to cover the subject in each of the major forested regions of the United States and Canada.

While some Foundation funds will probably go into research in the future, the Foundation does not expect to directly subsidize many scholars in their research efforts. Its resources and facilities do not permit any large expenditures of research funds. As in its collecting and preserving program, it seeks to serve as a clearing house for research opportunities, to locate materials in which scholars may conduct their independent research, and to aid forest-related groups seeking scholarly research and writing of their history to find professional help. Such projects as the Foundation may underwrite will probably be those which are most likely to stimulate other independent research and writing.

Several research projects were undertaken by staff members in the early days of the Foundation. William Rector began a study of log transportation in the Lake States which developed into a fine doctoral dissertation and was published in 1953 by the Arthur H. Clark Publishing Company as one of its "American Waterways Series." George B. Engberg, then a graduate student at the University of Minnesota, began a study of labor in the Lakes States lumber industry. Now he is in the process of revising the manuscript and the Foundation has scheduled it for publication some time next year. Mrs. Lillian Willson made a study of conservation in colonial times and her monograph on the subject was published by the Foundation in 1948.

Other monographs published by the Foundation include "*A Survey Of Forest History Resources For The St. Croix Valley*" by Helen McCann White, 1955; "*Time In The Timber*" by C. M. Oehler, 1948; and "*The Man Who Knew Trees, The Autobiography of James W. Girard,*" 1949. The Foundation has also published three books: *Forest History Sources Of The United States and Canada, 1956; The Biltmore Story: Recollections Of The Beginning Of Forestry In The United States* by Carl Alwin Schenck, edited by Ovid Butler, 1955; and *Forests For The Future: The Story of Sustained Yield as Told in the Diaries and Papers of David T. Mason,* 1907-1950, edited by Rodney C. Loehr, 1952. When the Foundation is unable to sponsor publication of a worthy manuscript, it endeavors to give the author assistance in finding a publisher.

A good beginning has been made by the Foundation in compiling a bibliography of forest history, but it is in tracking down unpublished source materials that it has thus far made its most notable progress. In 1949, the Foundation issued a 24-page mimeographed preliminary inventory of manuscript materials dealing with the history of the forest products industry in the United States. This guide cited 243 groups of manuscripts contained in the collections of 31 of the leading collecting institutions in 18 states and the District of Columbia. It was given wide circulation among libraries and scholars, and it has undoubtedly helped to arouse great interest in collecting and preserving forest industry records. This aid to scholars was one of the first, if not the first, such guide to business history manuscripts relating to a single industry which was compiled and published in this country.

In the summer of 1956, the Foundation published a second inventory, a 104-page indexed guide entitled "Forest History Sources of the United States and Canada." This volume cites 972 groups of manuscripts pertaining to lumbering, forestry, conservation, and other forest-related activities, in the collections of 108 of the lead-

ing libraries and archives of Canada and the United States. Manuscript resource material in 36 states, 4 provinces, and the District of Columbia are listed and briefly described in this volume. The collections considered encompass a period of more than three hundred years from the early seventeenth century into the mid-twentieth, and relate to all parts of the continent. This volume inventories only collections which are at present in manuscript collecting institutions. When the next edition is prepared the Foundation hopes to include other important collections such as papers of forestry and trade associations, records of state forest services and of forestry schools, business records retained by a company in its own archives, and records of forest conservation groups. Descriptive information concerning such collections of records are eagerly sought by the Foundation.

Another aspect of the Foundation's work is its oral history program. Through tape recorded interviews members of the Foundation's staff attempt to obtain personal accounts of the experiences of men who have played important roles in forest history, or who can supply information which the written record does not contain. These are transcribed, submitted to the interviewee for correction and approval, then are retyped, bound, and placed in suitable libraries or archives.

The Foundation's staff consists of a director, Elwood R. Maunder; field representative, Bruce C. Harding; research associate, Clodaugh M. Neiderheiser; secretary for oral history, Ann Lindquist; and office secretary, Grace Galvin. Inquiries regarding the Foundation or requests for research assistance should be addressed to the Foundation's headquarters at 2706 West Seventh Boulevard, St. Paul 16, Minnesota

❦❦❦

New Book Published on America's Natural Resources

How to conserve this country's natural wealth in the face of rising population and per-capita consumption is the subject of a new book entitled AMERICA'S NATURAL RESOURCES, published April 15 by the Ronald Press Company.

It has been edited for the Natural Resources Council of America by a committee headed by Charles H. Callison, conservation director of the National Wildlife Federation. Other members of the committee are Henry Clepper, executive secretary, Society of American Foresters; Michael Hudoba, Washington editor of *Sports Afield*, and Richard W. Westwood, president, American Nature Association. The book retails for $3.75.

This is a concise summary of the basic facts about soil, water, grasslands, forests, and each of the other major renewable resources—so presented as to be immediately useful to the reader who has little knowledge of the scientific details.

Each topic is covered in a separate chapter by a leading authority who sketches the historical background, points out the importance of the resource to human life, shows the dangers that threaten it, and explains sound methods by which it may be preserved and used most profitably in the long run.

Introductory and final chapters give a broad perspective of natural and world conservation problems. Emphasis throughout is on the interdependence of all living things and the relationship between resources.

A listing of the chapter authors follows:

"Conservation: An Ecological Approach," by Shirley W. Allen, professor emeritus of forestry, University of Michigan.

"Renewable Resources and Human Populations," by Fairfield Osborn, president, The Conservation Foundation.

"Soil," by Firman E. Bear, chairman of the soils department, Rutgers University.

"Water," by H. G. Wilm, associate dean, College of Forestry, State University of New York.

"Grasslands," by David F. Costello, chief, Division of Range Research, Pacific Northwest Forest and Range Experiment Station.

"Forests," by Henry Clepper, executive secretary, Society of American Foresters, and Lowell Besley, former forester, American Forestry Association.

"Wildlife," by Joseph J. Shomon, chief, Division of Education, Virginia Commission of Game and Inland Fisheries.

"Fish," by Albert S. Hazzard and William Voigt, Jr., Pennsylvania Fish Commission.

"Parks and Wilderness," by Howard Zahniser, executive secretary, the Wilderness Society.

"Land Use Principles and Needs," by Edward H. Graham, director, Plant Technology Division, U. S. Soil Conservation Service.

"Needed: A Natural Resources Policy," by Ira N. Gabrielson, president, Wildlife Management Institute.

Here is essential reading for all who are concerned with America's natural resources, and wish to take intelligent action in their defense as individuals or on community, state, or national levels.

Combining Two Species with Different Rotational Ages in Determining the Allowable Annual Cut

John F. Bell
and Marvin L. Helland[1]
Oregon State Forestry Department,
Salem

THE OREGON State Board of Forestry is responsible for the management of a tract of 138,043 acres of timberland situated within Clatsop County. The majority of these were tax delinquent lands and were subsequently deeded to the Oregon State Board of Forestry by the Clatsop County Court. Douglas-fir and hemlock are the two major timber types, and they comprise 128,077 acres. Appropriate rotations for the two types differ. It seems desirable, however, to regulate and manage the tract as a single management unit. To accomplish this end the regulation computations involved the combining of the two species and two different rotations in establishing a cutting budget. This paper sets forth the procedure that was followed.

An inventory of the Clatsop State Forest was completed in 1953. There was complete aerial photo coverage of the area. A majority of the photography was recent and at a scale of 1:12,000. Planimetric base maps with a scale of one inch to a thousand feet were prepared for each township within the project area. The forest types were then transferred to the base maps. The forest types were based on the standard forest type classification for the Pacific Northwest Region (*1*). A dot grid was used to obtain type acreages. These acreages were then recorded on a township forest-type summary sheet which indicated the type breakdown per section.

Choice of Rotation

In calculating the allowable annual cut, a rotation period was selected that would best serve the interests of the state and county. The age at which the culmination of the mean annual increment occurred for each major species was selected as the rotation age; this occurred at 70 years for hemlock and at 100 years for Douglas-fir (by Scribner rule trees 12.0 in. d.b.h. and larger) (*2, 5*). It was assumed that hemlock would be grown principally for production of pulpwood and Douglas-fir for production of sawlogs. Two other factors which were important affected the choice of rotation. The first factor was that the occurrence of decay in hemlock up to 70 years was negligible, but after this age it increased rapidly. The second factor was that a rotation taking advantage of maximum productive capacity is possible under public ownership while private ownership is limited to a shorter rotation because of the adverse effect of taxes and compound interest on timber investments.

Allowable Annual Cut—Area Regulation

Area regulation is the most simple and direct means of approaching a normal distribution of age classes when developing an even-aged forest property. After a normal distribution of age classes has been secured, it is then possible to harvest an equal annual volume on a sustained basis indefinitely (*3*).

In general, western hemlock grows in the western half of the county while Douglas-fir predominates in the eastern part of the county where the state has the majority of its ownership. However, there is some difficulty in separating the forest types into Douglas-fir and hemlock because of the intermingling of these two species. The two major types were combined in calculating the allowable annual cut in order to bring about a better distribution of age classes and to take advantage of the present preponderance of mature hemlock.

Table 1 presents the information and illustrates the procedure used in calculating the allowable annual cut for the Clatsop State Forest during the adjustment period.

Acres for each age class by species were obtained from the township summary sheets and entered in column 3 of Table 1. The Douglas-fir age classes 10 and 20 comprise 38.5 percent of the area while the Douglas-fir age classes 30 through 90 combined with hemlock age classes 0 through 60 comprise 37.2 percent of the area. This irregular distribution of age classes made an adjustment period necessary in order to approach a normal distribution of age classes for the second rotation. In addition, unacceptable minimum cutting ages would result if normal area regulation was employed. The length of the adjustment period is determined by trial and error, and it is based on an acceptable minimum cutting age for each species. A minimum cutting age of 55 was set for hemlock and a minimum of 85 was set for Douglas-fir. These minima give needed flexibility in the adjustment procedure and assure that timber will not be cut below a practical minimum cutting age.

Under normal area regulation 1,485 acres would be cut each year which would result in a minimum cutting age of 40 years for hemlock and 70 years for Douglas-fir. Through trial and error it was found that acceptable minimum cutting ages could be maintained by cutting 92,918 acres or 72.6 percent of the area in 90 years. Thus, an average of 1,032 acres can be

[1]Respectively, staff forester in charge of forest inventory-management planning, and timber management director.

TABLE 1.—SUMMARY OF GROWING STOCK DATA FOR CLATSOP STATE FOREST INCLUDING COMPUTATIONS FOR THE PERIODIC ANNUAL CUT UNDER A MODIFIED SYSTEM OF AREA REGULATION

Column 1	2	3	4	5	6	7	8	9	10	11	12
Age class		Area				Stocking percent		Yield at cutting age			
		Acres	Percent of total area	Cutting time	Range	Ave.	Present	At cutting age	(Mbf/A) cut yr. property (Mbf)	Gross periodic annual cut for Decade no.	Gross cut per decade (Mbf)
Douglas fir	*Hemlock*		*D.F. Hem.*	*Age class Cumulative*							
	70 + (M & OM)	12,896	0.5 10.1	12.52							
100 + (M & OM)		599	0.5	.62	13					40,085	1 400,850
	60 (55-65)	4,585	3.6	4.46	18	73-78	75	51	68 69		(Net)
90 (85-95)		269	0.2	.25		103-108	105	38	45 42	69,804	2 597,667
	50 (45-55)	1,378	1.1	1.36	20	65-73	69	57	77 72		
80 (75-85)		796	0.6	.74		95-103	99	35	49 44	64,196	3 558,504
	40 (35-45)	1,051	0.8	.99	23	58-65	61	53	74 60		
70 (65-75)		2,184	1.7	2.11		88-95	92	51	63 52	56,304	4 583,153
	30 (25-35)	2,905	2.3	2.85	29	54-58	56	50	77 53		
60 (55-65)		3,550	2.8	3.47		85-88	86	59	71 54	55,264	5 609,910
	20 (15-25)	5,676	4.4	5.45	39	54-54	54	58	85 54		
50 (45-55)		4,494	3.5	4.34		84-84	84	65	79 59	58,018	6 650,343
	10 (5-15)	14,550	11.3	14.01	55	60-54	57	51	87 59		
40 (35-45)		1,473	1.2	1.49		90-84	87	55	77 60	60,991	7 734,880
	0 (— 5 to +5)	1,305	1.0	1.24	59	54-60	57		85 57		
30 (25-35)		3,416	2.7	3.35		84-90	87	59	83 64	64,095	8 734,880
	—10 (—15 to —5)	3,358	2.6	3.22	90	75-54	65		85 73		
20 (15-25)		28,433	22.2	27.52		105-84	95	51	83 71	73,488	9 734,880
	Total	92,918	72.6 percent	90 years						Weighted average volume cut per year, first 90 years 62,279Mbf	

1,032 acres per year

cut each year. To smooth out the adjustment period, each figure in the percent of the total area column (column 4, Table 1) is multiplied by the ratio of 90/72.6 which gives the number of years that cutting will last in the specified age class (column 5, Table 1). The figures on the right side of column 5 become the cumulative years of operation. A more normal distribution of age classes is attained by the end of the adjustment period which is shown in Figure 2. Figure 1 shows the distribution of age classes prior to the adjustment period.

Following the 90 year adjustment period, it is possible to attain the sustained cut of 1,485 acres each year. However, there will continue to be minor adjustments within the individual age classes until a normal distribution of age classes is reached.

To obtain the range of cutting ages (column 6), as for example the 60 year old hemlock, the cumulative time at the end of the cutting of this class, which is 18, is added to the youngest, age 55, which gives 73, the lower limit. The upper limit is obtained by adding 13 to 65, which is 78. The midpoint of the range, 73—78, is rounded to 75 which becomes the average cutting age.

Present stocking (column 8) for each ten-year age class was determined by using a weighted average (acres in each density) of the midpoints, 25 percent, 55 percent, and 85 percent for the three standard density classes.

Future stocking (column 9) was determined by using present stocking and adjusting it for increase toward normality. Bruce's table (*4*) for increase toward normality was used for Douglas-fir and the unpublished revision of U. S. Department of Agriculture Bulletin 544 was used for increase toward normality for hemlock (*2*).

An average site index of 170 for Douglas-fir and hemlock was determined from approximately 500 site measurements.

Column 10, yield at cutting age, is determined by using the average cutting age and interpolating the

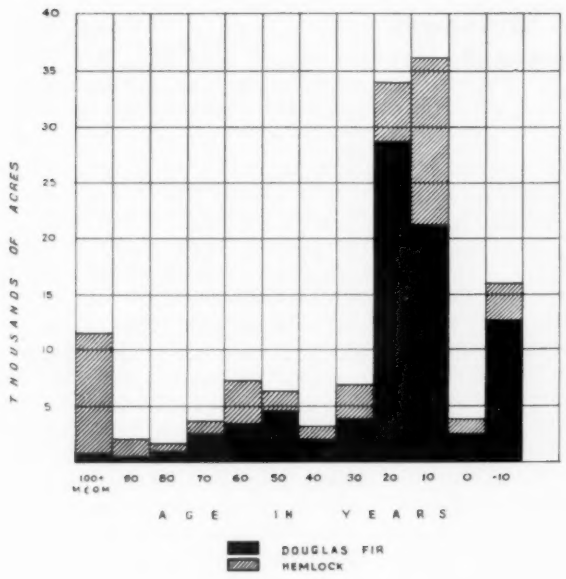


FIG. 1.—Acreages of Douglas-fir and hemlock by age classes—1952.

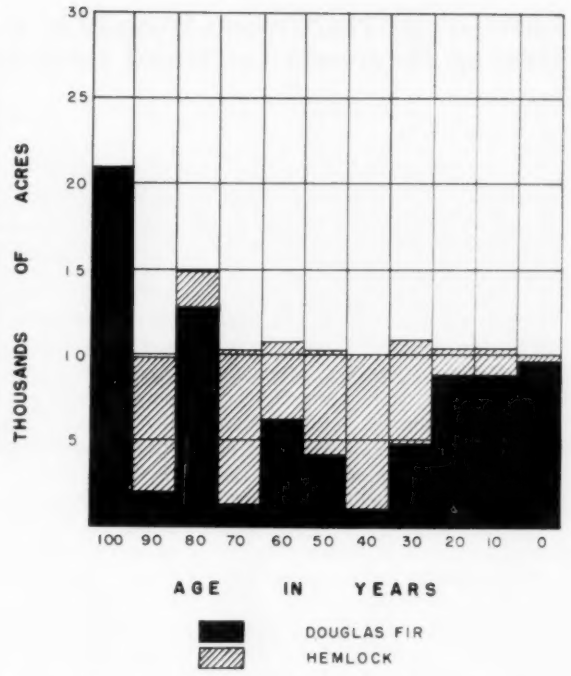


FIG. 2.—Acreages of Douglas-fir and hemlock by age classes at end of first 90 years of operation.

volume from the normal yield tables. This volume was then multiplied by the future stocking ratio to get the yield per acre of each class. Table 4 from Department of Agriculture Technical Bulletin 201 (*5*) was used for Douglas-fir and Table 2.21 from the unpublished revision of Bulletin 544 (*2*) was used for hemlock.

The two species were combined to give column 11 which is the gross periodic annual cut for the property. It is noted that there has been a somewhat gradual increase in the net allowable annual cut from 40MM board feet per year, during the first decade, to 73MM board feet per year during the ninth decade.

The following is an example of how the gross periodic annual cut for the property (column 11) was computed:

60 year hemlock 3.6) From percent
90 year Douglas-fir 0.2) of total area column

(1,032 acres will be cut over each year during the adjustment period)

$\frac{3.6}{3.8} \times 1{,}032$ equals 980 (acres of hemlock cut per year during this period)

980 × 69 equals 67,620 M board feet of hemlock.

1,032 minus 980 equals 52 (acres of Douglas-fir)

52 × 42 equals 2,184 M board feet Douglas-fir.

67,620 M.b.f.
2,184

69,804 M.b.f. which is the average annual cut for this five-year period.

Because volume per acre varies considerably it is difficult to cut over an equal number of acres each year. The objective is to have the number of acres cut each year stay within the average allowable area allotment for any given five-year period. Volume will determine to a large extent the acreage cut in any one year. The entire calculations can be revised from time to time, probably at ten year intervals, to compensate for changes in growing stock, utilization standards, ownership, and other variables affecting the allowable annual cut.

This is a brief summary of the way in which the allowable annual cut is calculated for two species with different rotational ages, by combining them in the final step of the area regulation method.

Literature Cited

1. ANON. 1952. Forest type classification for the Pacific Northwest Region, revised edition. Pacific Northwest Forest and Range Expt. Sta., Portland, Ore.
2. ———. (None) Volume tables for western hemlock. Pacific Northwest Forest and Range Expt. Sta. (in manuscript).
3. BARNES, GEORGE H. 1950. Timber management. Oregon State College Cooperative Association, Corvallis, Ore. 95 pp.
4. BRUCE, DONALD. 1948. A revised yield table for Douglas-fir. Pacific Northwest Forest and Range Expt. Sta., Portland, Ore.
5. MCARDLE, R. E., and W. H. MEYER. 1949. The yield of Douglas-fir in the Pacific Northwest. U. S. Dept. Agric. Tech. Bul. 201, revised.

Low-Grade Hardwood Stands in the Missouri Ozarks Respond to Stand Improvement

F. Bryan Clark and Franklin G. Liming[1]
Central States Forest Experiment Station, Forest Service, U. S. Department of Agriculture

NEARLY HALF of Missouri's gross sawtimber volume is unmerchantable under present standards.[2] Moreover, more than one-third of the gross volume is in cull trees and trees of noncommercial species (Fig. 1). Similar conditions exist in all the other central hardwood states. Obviously, general stand improvement is in order.

Before stand improvement work in low-grade hardwood stands becomes an accepted practice, it must be demonstrated that treated stands will produce bigger and better future timber harvests. A study begun 17 years ago provides information on the growth response of thinned, low-grade hardwood stands in the Missouri Ozarks. This same study also shows how pine, planted under the hardwood overstory, responds to release. The information given here is just a small part of the answer to a big problem in hardwood management, but it provides leads for future work.

[1]Clark is stationed at Bedford, Indiana and was formerly at the Columbia Research Center. Liming is forester in charge of the Columbia Research Center, Columbia, Missouri.

[2]King, D. B., E. V. Roberts, and R. K. Winters, Forest resources and industries of Missouri. Mo. Univ. Res. Bul. 452, 89 pp., illus. 1949.

The Study Area

Early in the spring of 1938 a study was begun on the Clark National Forest to determine how advanced hardwood reproduction and shortleaf pine (*Pinus echinata* Mill.) planted under a hardwood overstory responded to different degrees of overhead release.[3] Advantage was taken of this study to measure the response of the residual hardwood overstory to four different densities of stocking.

The study area is located in Reynolds County on a dry, gentle, upper, southwest slope. The soil is classed as Clarksville stony loam. The stands were about 40 years old and were mostly oak and hickory with a few scattered second-growth pine. Before they were thinned, the stands contained approximately 340 trees per acre at least 1 inch in diameter at breast height. Nearly three-fourths of the trees in the original overstory were of some of the least desired species: blackjack oak (*Quercus marilandica* Muenchh.), post oak (*Q. stellata* Wangenh.), and hickory (*Carya* Nutt.). About one-fourth of the trees were the more desirable black oak (*Q. velutina* Lam.), white oak (*Q. alba* L.), and shortleaf pine. The overstory trees averaged 33 feet in height and about 6.1 inches in diameter at breast height. The basal area of overstory trees averaged about 80 square feet per acre.

There were approximately 4,700 trees of reproduction size per acre when the study began. About 57 percent of these were post oak and blackjack oak. The hardwood reproduction was predominantly of sprout origin and had developed after the last fire on the area. The tops of these sprouts were three to five years old and 1 to 3 feet in height. Although there were a few natural pine seedlings on the area,

FIG. 1.—Typical low-grade hardwood stand.

[3]Liming, Franklin G. Response of planted shortleaf pine to overhead release. Cent. States Forest Expt. Sta. Tech. Paper 105, 20 pp., illus. 1946.

most of the reproduction-sized pine was planted in the fall of 1936. Shortleaf pine made up about 11 percent of all reproduction (including planted trees) when the study began.

Treatment

Thinnings of four intensities were made removing none, one-third, two-thirds, and all of the overstory basal area. The resulting stocking of residual overstory trees was about 79, 53, 27, and 0 square feet of basal area per acre.

Each treatment, except the check (no release), was made on nine 1/10-acre plots. Only six plots were used for the check. Each plot was square and was surrounded by a ½-chain isolation strip. Four randomly located strips 6.6 feet wide and 66 feet long in each plot provided data on reproduction-sized trees (less than 1 inch d.b.h.). Measurements were made when the study began after the 1937 growing season, after the 1948 growing season, and late in the 1954 growing season.

Because the primary objective of the study was to test the reaction of the reproduction to overhead release rather than to make an improvement cutting in the hardwoods, the hardwoods to be cut were selected with the idea of leaving the residual trees uniformly spaced. However, undesirable species such as blackjack oak and post oaks and trees with defects were removed when possible. The residual stand was somewhat less productive than it could have been, making the results of this secondary study rather conservative.

Basal Area Growth Varied by Density of Overstory

The stands on most of the plots are made up of two distinct parts: trees that were in at least the 1-inch d.b.h. class in the fall of 1937 are called the residual overstory; trees that grew from reproduction size into the 1-inch d.b.h. class and larger during the 17-year period are called understory trees.[4] The growth response for these two parts of the stands is different; consequently, results for each component are presented separately.

Table 1.—Average Annual Growth Percent of Overstory Trees

Basal area of overstory (Square feet)	Post oak	Blackjack oak	Pine	White oak	Black oak	All species
27	3.7	3.1	3.3	6.9	5.9	4.6
53	2.2	1.6	2.5	3.9	3.5	2.7
79	0.2	−0.1	1.8	2.3	3.0	1.0

Overstory growth — The most heavily thinned stands had the greatest overstory growth rate during the 17-year period (Table 1). Two things account for this: (1) less competition and (2) the relatively greater basal area of faster growing species such as black oak (Fig. 2). Stands reduced to 53 square feet of basal area in 1937

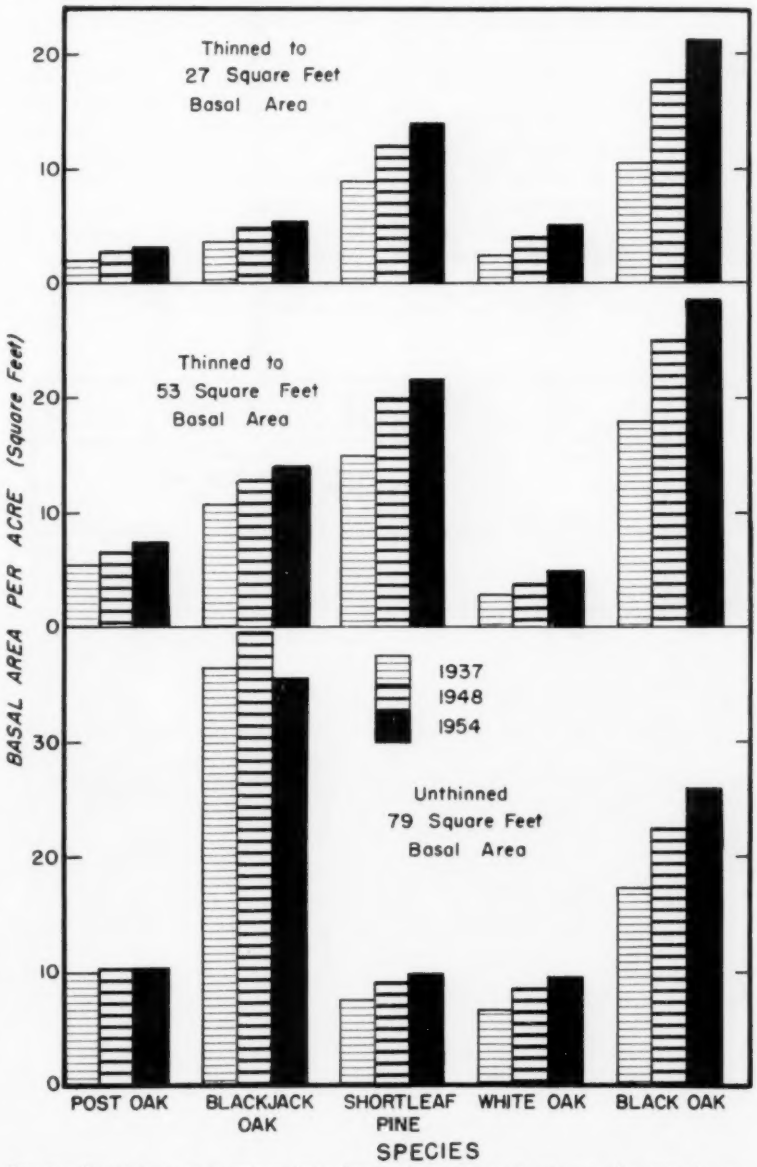


Fig. 2.—Basal area of overstory trees by species, year, and amount of residual overstory. Hickory and a few other species were present but not in great enough numbers to be of any consequence.

[4] On clearcut plots the trees were not actually in an understory.

TABLE 2.—BASAL AREA GROWTH PER ACRE, 1937 - 1954

Basal area changes	Intensity of thinning (Percent basal area removed)			
	100	67	33	0
	B.a. sq. ft.	*B.a. sq. ft.*	*B.a. sq. ft*	*B.a. sq. ft.*
Residual basal area 1937	0	27.0	53.2	78.5
Growth for 17 years				
Overstory	—	21.3	24.5	13.6
Understory	77.8	18.5	3.3	1.2
Total	77.8	39.8	27.8	14.8
B.A. 1954	77.8	66.8	81.0	93.3

had the greatest actual increase (Table 2).

The basal area growth rate in the stands containing 27 and 53 square feet when the study began was constant during the two periods 1937-1948 and 1949-1954 (Fig. 3). But the basal area growth rate dropped off during the period 1949-1954 in stands where no trees were removed at the beginning of the study. The clearcut stands of course had no overstory.

The average annual basal-area growth percent was greatest for white and black oaks and least for blackjack and post oaks (Table 1). In the unthinned stands blackjack oak mortality was greater than growth, and post oak grew very little. Blackjack oak had the highest mortality of all species and mortality was greater for small trees than for large trees. Mortality was greatest in the most dense stands: 11.8 square feet of basal area per acre in the unthinned stands, and only 1.8 and 0.2 square feet in the stands thinned to a basal area of 53 and 27 square feet. The cause can probably be attributed to more competition and a greater number of "poor risk" trees.

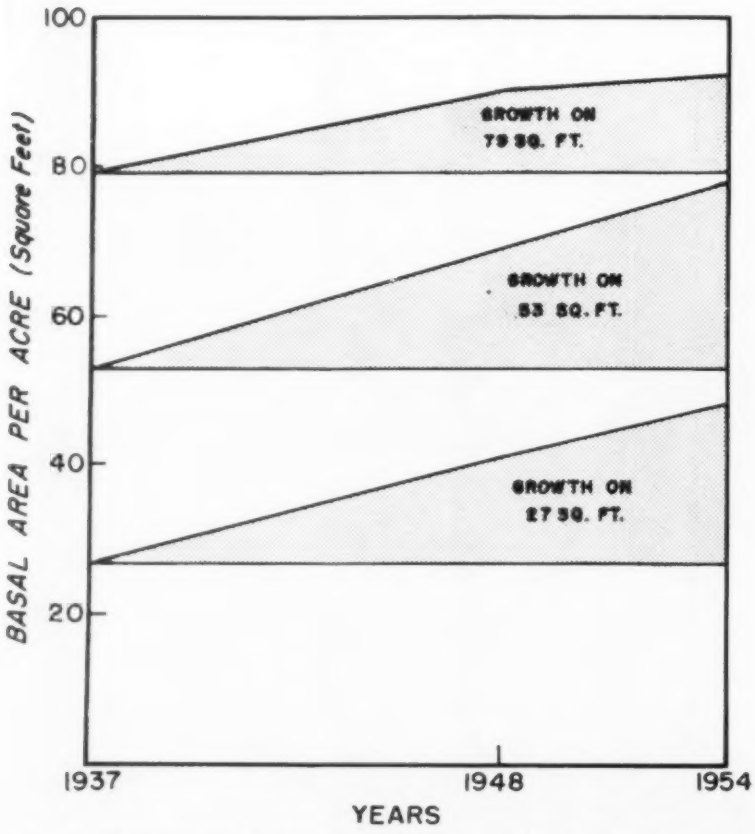


FIG. 3.—Basal-area growth of overstory trees by amount of residual overstory.

Understory growth.—The amount of residual overstory greatly influenced the number and size of hardwood and pine trees that grew from reproduction size into at least the 1-inch d.b.h. class by 1954. (Trees less than 0.6 inches in d.b.h. in 1954 were not counted.) The number of trees growing into the understory was highest in stands that had the least overstory. This same relationship existed between the basal area of understory trees and the density of the residual overstory. Basal area per acre of understory trees in 1954 was 77.8, 18.5, 3.3, and 1.2 square feet where the residual overstory was 0, 27, 53, and 79 square feet, respectively.

The various species responded differently to overhead release. In general, the relative number of undesirable species (post oak, blackjack oak, and others[5]) decreased during the 17-year period. In stands where all of the overstory was left, no blackjack or post oaks reached the 1-inch d.b.h. class by 1954. The relative abundance of species that are desirable from the timber management standpoint (pine, black oak, and white oak) increased during the 17-year period.

Reducing the residual overstory increased basal-area growth of all species and the greatest increase in basal area was made by shortleaf pine (Fig. 4). Although pine made up only 22 percent of the understory trees on clearcut plots, it accounted for five times as much basal area as the next highest species.

Understory and overstory combined.—The 1954 basal areas of understory and overstory combined were 78, 67, 81, and 93 square feet per acre for stands originally containing 0, 27, 53, and 79 square feet of residual over-

[5] "Others" includes blackgum (*Nyssa sylvatica* Marsh.), sassafras (*Sassafras albidum* (Nutt.) Nees), and sumac (*Rhus* spp. L.).

story, respectively. Total basal-area growth varied inversely with the amount of residual overstory and the greatest growth occurred on clearcut plots. The average annual basal-area growth percents for understory and overstory trees combined were 8.7, 3.1, and 1.1 for stands reduced to 27, 53, and 79 square feet in 1937.

Significance of Results

Many of the overstory trees in present Missouri stands need to be eliminated. These cull and low-grade trees should be removed from the stands as soon as possible to stimulate the growth of the residual trees and encourage the establishment and growth of natural reproduction.

The basal-area increase of overstory during a period of 17 years in stands where one-third of the original overstory and no overstory was removed was found to be 24.5 and 13.6 square feet. So two acres of unthinned timber produced only a little more basal-area growth than one acre of lightly thinned timber. However, this represents gross increment which must be reduced by about one-third in unthinned stands for growth on trees that will never be merchantable. In other words, the net growth in the treated stand was more than twice the net growth in the untreated stand. This increased growth on the better trees should make investment in stand improvement worthwhile.

A silvical characteristic of blackjack and post oaks was demonstrated in the unthinned stands in both the understory and overstory.

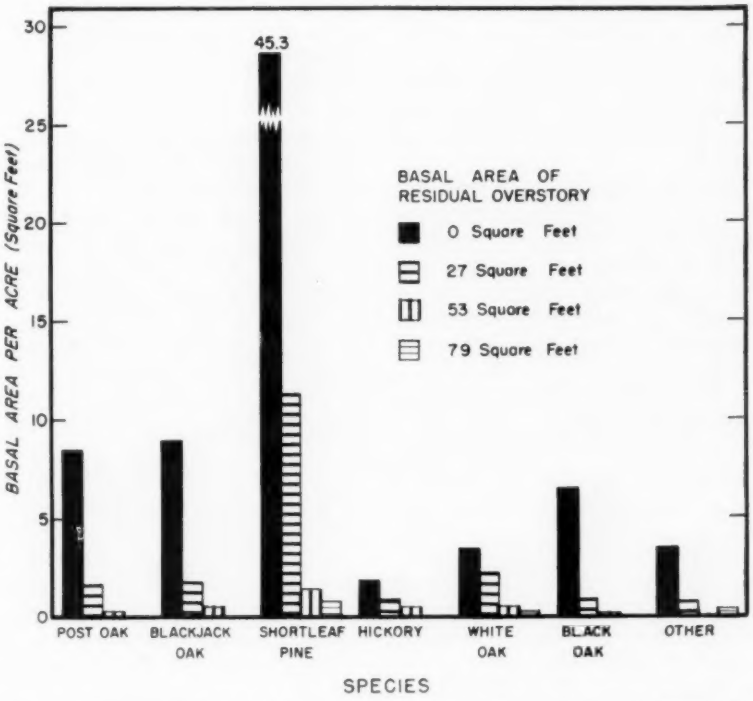


FIG. 4.—Basal area of understory trees in 1954 by species and amount of residual overstory in 1937.

FIG. 5.—*Left*, shortleaf pine growing where no overstory trees were removed averaged about 6 feet in height in 1954. *Right*, pine growing where all the overstory trees were removed averaged 25 to 30 feet in height in 1954.

It was found that these two species are being replaced by the more desirable trees. Blackjack and post oaks did not grow into the understory even though these species were quite prominent in the original reproduction count. Blackjack oak accounted for most of the mortality of overstory trees in the stands during the 17-year period. Liming[6] found the same successional trends in blackjack oak stands throughout the Missouri Ozarks.

The basal-area growth rate during the 17-year period remained constant for stands containing 27 and 53 square feet of basal area when the study began. But, in stands that were not thinned, the basal-area growth rate dropped off after 1948. The implication is that the untreated stands had closed and basal-area growth rate slowed down; whereas, stands that had been thinned had sufficient room to grow during the entire 17-year period. During the 1949-1954 growth period, three out of the five growing seasons were very dry. This undoubtedly had some effect on growth and mortality during this period.

Important principles in the management of pine reproduction have been demonstrated in this study. Where all of the overstory was removed, pine responded vigorously to the release. Stands completely released grew from no basal area to 78 square feet in just 17 years; pine accounted for more than half of this basal area. In stands where as little as 27 square feet of basal area of overstory trees were left, the response to release was only a fourth as great as for complete release. If rapid development of pine reproduction is desired, complete release from overstory competition is necessary (Fig. 5). It was also demonstrated that under the conditions studied, pine outgrows hardwood reproduction.

Although the unthinned stands did not appear overcrowded, the basal-area growth rate indicates that the stocking for stands similar to those studied should be something less than 90 square feet basal area per acre if maximum basal-area growth is desired. Basal-area growth is just one of many things which must be considered in determining the optimum stocking of a stand at a given age. The study has provided a clue to the management of young hardwood stands.

[6] Liming, Franklin G. Blackjack oak in the Missouri Ozarks. Jour. Forestry 40: 249-252, illus. 1942.

Important Notice to Subscribers

If you change your address please notify the JOURNAL OF FORESTRY, preferably in advance, by letter, post card, or post office form number 22-S. Be sure to give your old, as well as the new, address with your postal zone number if any.

You should also notify your local post office on postal form number 22 of your change of address. Both postal forms are obtainable at any post office.

Copies of the JOURNAL will not be forwarded by the Post Office Department. Hence, in order to avoid missing your copy as well as to prevent extra expense to the Society in supplying duplicates, you are urged to notify the JOURNAL as soon as you know your new address, a month in advance of change if possible.

JOURNAL OF FORESTRY
425 Mills Building
17th Street at Pennsylvania Avenue, N. W.
Washington 6, D. C.

Bud-Pruning Red Pine and Eastern White Pine in Northern Illinois

Howard W. Fox
Assistant professor,
Department of Forestry,
Illinois Agricultural Experiment Station,
Urbana, Illinois

THE ARTIFICIAL pruning of trees with saws has been a common practice for many years. More recently, however, a system of artificial pruning referred to as "bud-pruning," or "Russian pruning," has been developed. Bud-pruning is started when trees are small by removing the lateral buds which ordinarily would develop into branches and leaving the terminal bud to grow. Lateral buds and branches are permitted to develop on the trunk near the ground line, the portion that normally forms the stump when the tree is harvested. Thus the tree is fed until a limb-free trunk is grown to a height of about 17 feet, for the most part, by the basal branches, the needles which develop on the bole, and the bark cells which contain chlorophyll. After the trunk reaches that height bud-pruning is terminated and the crown is allowed to develop in the usual manner.

Bud-pruning studies have been made by a number of investigators, most of whom have concluded that more study is needed before the practice can be recommended for general use.

In 1950 Glattfelder (*2*) summarized the bud-pruning investigations that had been conducted up to that time. Most of the bud-pruning tests have been made on northern species of pine. However, Rowland (*6*) in 1950 reported early results with bud-pruning slash pine.

In 1947 a study of the costs and practicability of bud-pruning eastern white pine (*Pinus strobus*) and red pine (*P. resinosa*) on Sinnissippi Forest[1] was initiated in cooperation with the Illinois Agricultural Experiment Station.

Methods

The study was conducted in a 34-acre pine plantation established in the spring of 1942. The area, previously an old pasture, was planted with 2-2 transplants spaced 6 feet apart in contour furrows plowed about 6 feet apart. The soils were Hagener loamy sand and O'Neil sandy loam.

A one-acre sample plot was located in the plantation at the junction of two large blocks of trees so that the north half of the plot contained 533 white pine and the south half 619 red pine.

All trees in the sample plot were pruned in the fall of 1947 at the age of 10 years from seed as follows:

1. The lateral buds were pinched from the leader by hand.
2. From two to three whorls of branches were left on the lower 18 inches of the trunk to feed the roots: all branches on the remainder of the trunk were pruned flush with the main stem with a hand-pruner (Fig. 1).

All pruning was done in the dormant season. After 1947 pruning consisted of removing the lateral buds with fingers, although occasionally it was necessary to sever with a knife the short woody branchlets which developed on red pine (Fig. 2).[2]

The white pine developed many adventitious buds along the main stem following pruning. Removal of the branchlets from these buds became such a problem that in 1950, 15 trees in one short row were stripped of all needles on the main stem, leaving only the terminal bud on each tree. The needles were stripped off because a bud would often form at the base of each set of needles and produce a branchlet the following year. The pruning of white pine also was complicated by the formation of a "double growth" during the year, requiring the removal of lateral branches as well as lateral buds.

The only variation in the pruning methods occurred in 1949, when all basal branches were cut to a height of 4 feet. The object of topping the thriftily growing side branches was to avoid the formation of a double or "candelabra" tree described by Paul (*4*). Bud-pruning was continued until the

FIG. 1.—Author removing lateral buds from white pine in 1947 when experiment was initiated. Note that two whorls of branches have been removed by clipping.

[1] A privately owned forest property in Ogle County, Illinois, being managed by the University of Illinois Department of Forestry under a cooperative agreement.

[2] Pruning 1 inch or less of woody growth supporting the lateral buds of red pine also has been mentioned by Paul (*4*).

FIG. 2.—A 10-foot stepladder was required to remove lateral buds of red pine in 1950.

FIG. 3.—Bud-pruned white pine as it appeared in 1953. Trees in foreground have started to develop a crown during the two years since they reached a height of 17 feet. The tree at the extreme right is under 17 feet in height and is still being bud-pruned.

tree reached 17 feet in height, or until 1953, when the experiment was terminated (Fig. 3).

Three rows of red pine and three rows of white pine containing 62 to 80 trees per row were randomly selected for height and diameter measurements. Half of the trees in each row were located within the plot, and the remainder were to the east of the plot where no pruning was done. The trees in the sample rows and outside the plot served as controls.

Height measurements were taken on pruned and unpruned sample trees immediately after the 1947 growing season and again each year thereafter until 1953. Diameter measurements were taken at breast height in 1953 and 1955. Attacks by the Zimmerman pine moth (*Dioryctria zimmermani*) and a severe drought in 1952 and 1953, however, made it necessary to abandon all height and diameter measurements except those made on 68 healthy trees of each species. Half of the measurements were made on pruned trees and half on unpruned or control trees.

The form of the bud-pruned trees appeared to be different from that of the control trees. Thus the d.b.h. and the diameter of the bole outside bark at a point one-half the height of the tree above d.b.h. were measured after the 1955 growing season on each of 20 randomly selected trees of each species. Half of the measurements were made on pruned trees and half on unpruned trees. The form quotient (FQ) of each tree was calculated as follows:

$$FQ = \frac{d}{d.b.h.}$$

, where d is the diameter of the bole in inches at a point located half the height of the tree above d.b.h. $\left(\frac{H}{2} + 2.25\right)$.

Pruning times were measured on 619 red pine and 533 white pine from 1947 to 1951. From 1951 to 1954, however, the number of trees pruned each year decreased as the trees reached 17 feet in height when pruning was abandoned. Pruning time included all the time required to set, ascend, and descend the ladder, as well as time required to move from one tree to the next.

The lengths of one-year old needles on the boles of 6 red pine and 6 white pine were measured to the nearest .01 centimeter. Half of the sample trees were pruned, and the remainder were unpruned trees.

Results and Discussion

Tables 1 to 4 and Figures 4 and 5 show measurement data as well as the effects of bud-pruning on height and diameter growth, tree form, and needle length.

Effect of pruning on tree height.

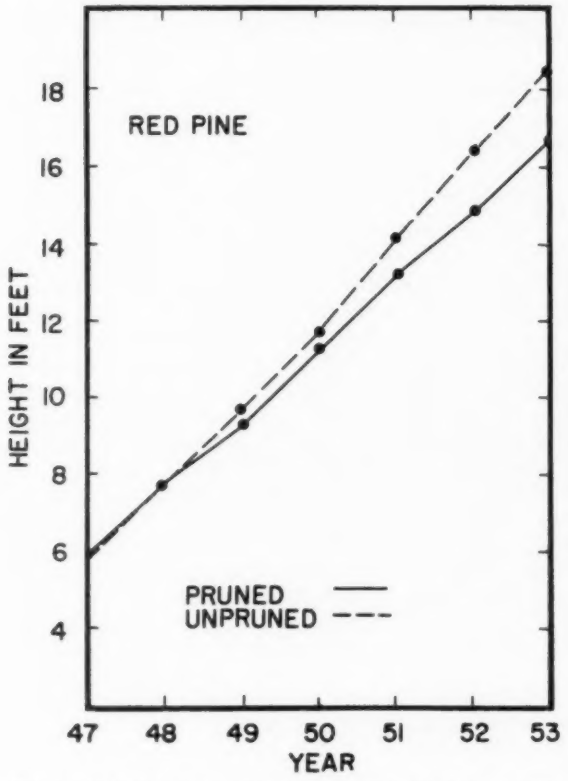


Fig. 4.—Height of bud-pruned and unpruned red pine by years for 6-year pruning period.

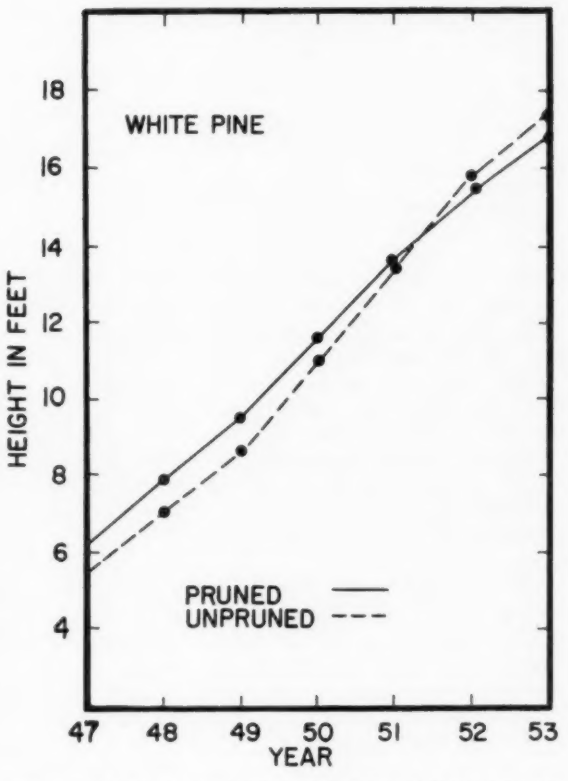


Fig. 5.—Height of bud-pruned and unpruned white pine by years for 6-year pruning period.

—In 1947 the average height of the 34 unpruned white pine trees was 5.44 ± 0.27 feet; the pruned trees averaged 6.15 ± 0.24 feet in height (Table 1). A Student's "t" test showed no significant differences between mean heights of pruned and unpruned white pine at the beginning of the study. The standard deviation for the unpruned trees was 1.56 feet and for the pruned trees, 1.40 feet.

The standard errors and standard deviations show that the trees were fairly uniform in height, and the two groups of trees had about the same distribution of heights.

In six years the unpruned white pine grew to an average height of 17.44 ± 0.75 feet, and the pruned trees to 16.91 ± 0.71 feet. The difference in mean heights was not significant.

In 1947 the unpruned red pine trees averaged 5.83 ± 0.11 feet in height, and the pruned trees were 5.85 ± 0.20 feet in height. Although a "t" test showed the mean heights for pruned and unpruned red pine in 1947 were not significantly different, the larger standard deviation for the pruned trees (1.12 feet) indicates greater dispersion of height measurements about the mean. The larger standard error (0.20 feet) for the pruned trees indicates less uniformity in height measurements.

In 1953 the average height of unpruned red pine was 18.67 ± 0.21 feet, and that for the pruned trees was 16.80 ± 0.27 feet. The difference between these means was significant and was attributed to lack of food resulting from the loss of crown. Standard methods of pruning commonly recognize the hazard of removing too much of the crown and the starvation of the tree as a result of crown loss. Al-

Table 1.—Height and Diameter Statistics for Unpruned and Bud-pruned Red and White Pine

	White pine				Red pine			
	Unpruned		Pruned		Unpruned		Pruned	
	Height	d.b.h.	Height	d.b.h.	Height	d.b.h.	Height	d.b.h.
	Feet	*Inches*	*Feet*	*Inches*	*Feet*	*Inches*	*Feet*	*Inches*
1947								
No. trees measured	34		34		34		34	
Average	5.44	—[1]	6.15	—	5.83	—	5.85	—
Standard deviation	1.56	—	1.40	—	0.64	—	1.12	—
Standard error	0.27	—	0.24	—	0.11	—	0.20	—
1953								
No. trees measured	34		34		34		34	
Average	17.44	2.85	16.91	1.69	18.67	3.57	16.80	2.48
Standard deviation	4.38	1.07	4.12	0.67	1.24	0.40	1.55	0.42
Standard error	0.75	0.18	0.71	0.11	0.21	0.07	0.27	0.07

[1]Dash means no measurement was made.

TABLE 2.—PERIODIC HEIGHT GROWTH STATISTICS FOR UNPRUNED AND BUD-PRUNED RED AND WHITE PINE, 1947 TO 1953

	White pine		Red pine	
	Unpruned	Pruned	Unpruned	Pruned
No. trees measured	34	34	34	34
Average total height growth—feet	12.00	10.76	12.84	10.95
Standard deviation—feet	3.06	3.34	0.93	1.44
Standard error—feet	0.52	0.57	0.16	0.25

TABLE 3.—AVERAGE LENGTH OF NEEDLES COLLECTED FROM LEADERS OF BUD-PRUNED AND UNPRUNED WHITE AND RED PINE

	Average length of leader needles	
	Inches	*Cm.*
White pine		
Unpruned trees	3.88	9.85
Bud-pruned trees	5.18	13.16
Red pine		
Unpruned trees	6.39	16.22
Bud-pruned trees	8.98	22.82

though this effect of pruning was not revealed by the white pine height measurements, the possibilities of detrimental effects are shown by the red pine height measurements. Once the pruning process starts, the volume of the "feeder branches" cannot be controlled as easily as the crown is controlled in the more commonly practiced method of branch removal.

On the other hand, if lack of control of the rate at which the crown is removed is the only detrimental effect of bud-pruning, then there is no reason why a whorl of "feeder branches" cannot be left at the top each year to feed the tree until the permanent crown starts to develop. The feeder branches then would be removed after one growing season. This modification is now being tested.

Effect of pruning on periodic height growth.—Table 2 shows that the unpruned white pine grew an average of 12.00 ± 0.52 feet from 1947 to 1953, compared to 10.76 ± 0.57 feet for the unpruned trees. The difference was not significant.

The average height growth of unpruned red pine trees was 12.84 ± 0.16 feet and 10.95 ± 0.25 feet for the pruned trees. There was a standard deviation of 0.93 foot for the unpruned trees and 1.44 feet for those pruned. The difference between mean height growths of pruned and unpruned red pine was significant.

The pruned white pine did not grow as straight and uniformly as the unpruned. Many trees seemed to develop weak leaders, probably because of decreased diameters, which tended to bend or droop. Some seemed to be affected by the pruning in such a way as to produce abnormal spiral or very crooked growth. These growth characteristics and weak stems were not observed in the pruned red pine.

Effect of pruning on tree diameter.—By 1953 the sample trees had grown to a size large enough for d.b.h. measurements. The average d.b.h. of unpruned white pine, as shown in Table 1, was 2.85 ± 0.18 inches and that of pruned trees was only 1.69 ± 0.11 inches. The difference between mean diameters was significant. The standard deviation for unpruned trees was 1.07 inches and for those pruned 0.67 inch.

The average red pine d.b.h. measurements were 3.57 ± 0.07 inches for unpruned trees and 2.48 ± 0.07 inches for those pruned. The difference in the mean was significant. The standard deviation for d.b.h. measurements on unpruned trees was 0.40 inch and 0.42 inch for the pruned trees. Again the means were found to be significantly different.

Further discussion of the effect of pruning on tree diameter is included in a subsequent section concerning form quotient.

Effect of pruning on needle length.—Table 3 shows that the average length of needles collected from the leaders of unpruned white pine was 3.88 inches, whereas that of the bud-pruned trees was 5.18 inches. The needles from the leaders of bud-pruned red pine also were longer (8.98 inches) in comparison with those obtained from unpruned trees (6.39 inches). Figures 2 and 3 show the abnormally long needles which developed on both species. Thus the bud-pruned white pine needles were 25 percent longer and the red pine needles were 29 percent longer than the needles obtained from unpruned trees.

Chapman and Taylor (*1*) reported on abnormal needle growth of bud-pruned red pine trees, stating that the average bud-pruned needles of red pine were 34 percent longer than the needles on unpruned trees. Somewhat smaller abnormal needle growth was found in this experiment.

The greater needle length must have been the result of environmental changes brought about by the type of pruning. Food materials for the main stem of bud-pruned trees were probably manufactured entirely by the abnormally long needles on the stem and some of the bark cells which contain chlorophyll.

When the needles on white pine were removed from the stem, the bole died back to the basal whorls of branches. Young and Kramer (*7*) reported that the diameter of the tree at any given point is dependent upon the branches above (but not below) that point. This indicates that food manufactured by the needles is not carried up the tree. Therefore, when the needles were removed, the tree died back to the basal whorls.

Effect of pruning on tree form.—Form statistics for pruned and unpruned red pine and white pine are shown in Table 4. The average form quotient after the 1955 growing season was 0.53 ± 0.01 for the unpruned white pine and 0.75 ± 0.02 for pruned white pine. The difference between these average values was highly significant.

The average form quotient for the unpruned red pine was 0.63 ± 0.03 and 0.78 ± 0.02 for the pruned trees. The difference between the average form quotient was highly significant.

Time required to bud-prune trees.—The average length of time required to bud-prune red pine and white pine is shown in Table 5.

TABLE 4.—FORM-QUOTIENT STATISTICS FOR UNPRUNED AND BUD-PRUNED RED AND WHITE PINE AFTER THE 1955 GROWING SEASON

	White pine		Red pine	
	Unpruned	Pruned	Unpruned	Pruned
No. trees measured	10	10	10	10
Average-form quotient[1]	0.53	0.75	0.63	0.78
Standard deviation	0.04	0.05	0.09	0.05
Standard error	0.01	0.02	0.03	0.02

[1]Form quotient = $\frac{\text{Diameter in inches } 1/2 \text{ the height of the tree above d.b.h.}}{\text{d.b.h. inches}}$

TABLE 5.—AVERAGE TIME REQUIRED TO BUD-PRUNE WHITE AND RED PINE

	Red pine		White pine	
Year	No. trees pruned	Minutes per tree	No. trees pruned	Minutes per tree
1947	619	.56	533	.56
1948	619	.63	533	1.52
1949	619	1.04[1]	533	1.74[1]
1950	619	.99	533	1.13
1951	619	1.20	492	3.00
1952	477	1.89	393	2.82
1953	21	2.38	14	3.22
Total		8.69		13.99

[1]Includes time required to top vigorous basal branches.

The red pine were pruned in an average of 8.69 minutes (0.144 hour), whereas the white pine required 13.99 minutes (0.233 hour).

Hawley and Clapp (*3*) found that branch-pruning trees to a 17-foot height in three operations took 0.164 hour for red pine and 0.227 hour for white pine. They also stated that to prune to 17 feet in one operation took 0.146 hour for red pine and 0.225 hour for white pine. Ralston (*5*) has reported pruning time studies for red pine in Minnesota with an average time of 9.0 to 10.5 minutes per tree when pruned in three stages to 17 feet.

The abnormally long times spent in pruning trees in 1949 were due to the topping of the tall laterals to prevent the "candelabra" type of branch growth which accompanies bud-pruning. The longer time required for the white pine resulted from the many adventitious buds along the main stem and the double growth produced each year.

Summary and Conclusions

Height, diameter, and height growth measurements were taken on 68 red pine and 68 white pine trees growing in a 34-acre plantation in northern Illinois. Half of the sample trees were bud-pruned. The measurements were begun on 10-year-old trees and were made annually thereafter until the trees were 16 years old.

The time required to bud-prune trees and the effects of bud-pruning on needle length and tree form also were studied. Bud-pruning consisted of hand-pinching the lateral buds from the leader of each tree until the tree reached 17 feet in height. The terminal bud and two or three whorls of branches on the lower 18 inches of the trunk were allowed to remain on each tree.

There was no significant difference between the average heights of red and white pine at the beginning of the experiment in 1947. However, after six years, the average height of unpruned red pine was significantly greater than the average height of pruned trees. There was no significant difference in the heights of the pruned and unpruned white pine after six years of growth.

Measurement of periodic height growth showed that pruning had no effect on the white pine, but the unpruned red pine had a greater periodic height growth than the pruned trees.

Diameters at breast height were greater for unpruned red pine and white pine than for pruned trees. The difference was attributed to the presence of branches above the point at which diameter was measured and the movement of food materials to this point.

The average length of the needles obtained from the leader of pruned trees was greater than that of unpruned trees. This result was attributed to the tendency of the trees to compensate for loss of crown.

The form quotients of the pruned trees of both species were significantly greater than those of the unpruned trees.

Less pruning time was spent on red pine to produce 17 feet of bud-pruned bole than is normally spent in removing branches in either one-stage or three-stage operations. The time required to bud-prune white pine was slightly greater, but probably not significantly so, than for the more conventional method of branch removal.

Literature Cited

1. CHAPMAN, G. L., and R. F. TAYLOR. 1951. Nine years of bud-pruning in a red pine plantation. Univ. of Maine Forestry Dept. Tech. Note No. 10.
2. GLATTFELDER, CALVIN F. 1950. Is bud-pruning of forest trees practical? Pennsylvania Forest and Waters, Vol. 2, No. 4, p. 88.
3. HAWLEY, R. C., and R. T. CLAPP. 1935. Artificial pruning in coniferous plantations. Yale Univ. School of Forestry Bul. No. 39.
4. PAUL, BENSON H. 1946. Tree pruning by annual removal of lateral buds. Jour. Forestry, Vol. 44, No. 7, pp. 499-501.
5. RALSTON, R. A. 1954. Time required to prune red pine to various heights. Lake States Forest Expt. Sta. Tech. Note No. 391.
6. ROWLAND, CHARLES A., JR. 1950. Early results of bud-pruning in slash pine. Jour. Forestry, Vol. 48, No. 2, pp. 100-103.
7. YOUNG, H. E., and P. J. KRAMER. 1951. The effect of pruning on the height and diameter of loblolly pine (unpublished manuscript).

Effects of Site Treatment, Fertilization, and Brownspot Control on Planted Longleaf Pine

Harold J. Derr
Southern Forest Experiment Station,
Forest Service,
U. S. Department of Agriculture

ALTHOUGH LONGLEAF PINE (*Pinus palustris* Mill.) predominated in the virgin stands throughout the lower southern Coastal Plain, it has been little used in the extensive planting program undertaken by private forest landowners within the past 10 years. Foresters are generally recommending slash pine (*P. elliottii* Engelm.) and to a lesser extent loblolly pine (*P. taeda* L.) for planting on former longleaf sites, while recognizing that neither may be superior in all respects to the indigenous species. A main drawback to greater use of longleaf has been its tendency to remain in a grass stage for several years.

This stemless stage is generally recognized as a species characteristic. However, Pessin (*1*) and Siggers (*2*) demonstrated that two environmental factors—grass competition and brownspot needle blight (*Scirrhia acicola* [Dearn.] Siggers)—often extend the grass stage greatly, in extreme cases to 20 years or more. Their work with natural reproduction suggested that control of these two adverse factors might reduce the inactive growth period of planted seedlings.

In 1948-49 a study was established in central Louisiana to determine practical means for stimulating the growth of planted longleaf. Treatments used to modify environmental factors included preplanting site preparation to reduce competition, application of Bordeaux spray for brownspot control, and fertilization. These treatments were tested alone and in combination. The objective was to stimulate at least 75 percent of the surviving stand into active height growth within three to five years. Some latitude in time was allowed because climatic and edaphic variations affect the rate of early growth. To achieve this goal in three years was considered optimum for longleaf under field conditions.

The Study

Experimental area.—The study was established on the Palustris Experimental Forest, approximately 17 miles southwest of Alexandria, Louisiana. An open area, fairly representative of Louisiana's cutover longleaf land, was selected. The soil is Ruston fine sandy loam, a deep, medium-textured, slowly permeable upland soil with fairly good internal drainage. Topography is almost flat, but with enough slope for adequate surface drainage. The grass rough, not burned or grazed for five years prior to planting, consisted mainly of broadleaf bluestems (*Andropogon* spp.) interspersed with dense patches of cutover muhly (*Muhlenbergia expansa*). Brownspot infection in longleaf plantations has been severe ever since the experimental forest was established in the 1930's. Hogs and grazing animals were completely excluded throughout the study period.

Treatments.—Site preparations consisted of furrowing, disking, burning followed by disking, and burning alone. These were compared with planting in a heavy, 5-year-old rough. Furrows were made with a Ranger Pal fire plow, and were spaced on 6-foot centers. Seedlings were planted within the furrows, which averaged four inches deep. The grass rough was so heavy on the unburned plots that three diskings with a 6-foot tandem disk were needed to cut the grass rough into the soil, while the sod on burned plots was thoroughly pulverized in one operation. All sites were prepared one month before planting.

Half of the seedlings on each of the site-treatment plots were sprayed for brownspot control in May and November of the first two years, and in May only during the third and fourth years. Fermate, used in the first year, was considered ineffective that season, as there were no differences in the rate of brownspot infection between sprayed and unsprayed seedlings 12 months after planting. Standard 4-5-50 Bordeaux mixture was used thereafter, with good effect.

A single fertilizer treatment was included to determine if additional soil nutrients would improve seedling growth under varying degrees of grass removal. On each site-treatment plot, one-half of the seedlings, equally divided between sprayed and unsprayed groups, received a mixed fertilizer that supplied 30 grams of superphosphate, 6 grams of 25 percent potash, 15 grams of cottonseed meal, and 4 grams of 33 percent ammonium nitrate per seedling. This rate of fertilization is roughly equivalent to 100 pounds of 6-18-5 fertilizer applied to 1,280 planted seedlings per acre. In an attempt to minimize its effect on competing vegetation, the fertilizer was placed in the root zone of each seedling by pouring it into the closing slit made with the planting bar.

Two small supplemental tests were installed to determine (1) if the quantity of balanced fertilizer was important, (2) if the form of nitrogen influenced survival and growth, and (3) if the phosphorus and potash were needed with the nitrogen. In one of these tests, dosages were in the ratios of 0, 0.5,

1.0, and 2.0 to that used in the main experiment. The second small test compared the complete NPK fertilizer with organic nitrogen (cottonseed meal), inorganic nitrogen (ammonium nitrate), and a mixture of these two nitrogen sources. These elements were applied at the rate prescribed for the main test.

Experimental design.—A double-split, randomized block design was used in the main test. The five site preparation treatments, each replicated 4 times, were applied to ¼-acre square plots. These were split, and the spraying treatment assigned at random to one-half. A second split provided for random assignment of the fertilizer to one-half of the sprayed and unsprayed sub-plots. Thus, the study employed 80 sub-plots, each 1/16-acre in size and containing 80 planted trees, spaced 6 by 6 feet. The plots were hand-planted in February 1949 with seedlings grown in the Stuart Nursery, Pollock, Louisiana, from a Mississippi seed source.

Survival

After four growing seasons, survival for all treatments averaged 80.6 percent. It was 88.0 percent in June of the first year, and 83.6 percent after the first season. This exceptionally good survival probably resulted from favorable weather in the summer of 1949 when rainfall was above normal and well distributed. However, seedling losses in the three succeeding years, which were much drier, averaged only about one percent per year. This low rate of attrition is considered normal for planted longleaf that is unburned and completely protected.

The site preparations did not significantly affect survival, either at the end of the first year or four years after planting. In a season when more than 90 percent of the unfertilized seedlings planted in an old rough survived (Table 1), there was little need for controlling competition. Site treatments that disturbed the soil—furrowing and disking—reduced survival from 3 to 7 percent, and the lowest survival was recorded on burned plots.

TABLE 1.—SURVIVAL OF PLANTED LONGLEAF PINE SEEDLINGS AFTER 4 YEARS, BY TREATMENTS

Site treatment	Fertilized			Not fertilized			Average
	Sprayed	Not sprayed	Avg.	Sprayed	Not sprayed	Avg.	
	Percent						
Heavy grass rough (check)	85.6	80.3	83.0	92.2	84.7	88.4	85.7
Furrowing	83.4	72.8	78.1	91.2	82.8	87.0	82.6
Disking	75.0	75.3	75.2	87.8	76.9	82.3	78.8
Burning & disking	71.9	71.9	71.9	90.6	83.8	87.2	79.5
Burning	68.1	72.2	70.2	80.6	85.3	83.0	76.6
All site treatments	76.8	74.5	75.7	88.5	82.7	85.6	80.6

It is a recommended procedure to destroy existing brownspot on a longleaf planting site by burning prior to planting. This practice usually results in slightly higher mortality of the planted seedlings, but has compensations in the form of easier planting, hazard reduction, and brownspot control.

The fungicidal spray had little effect on survival in the first four years after planting. Average survival of sprayed seedlings on all plots dropped from 84.4 to 82.6 percent between the first and fourth years, while survival on the unsprayed plots dropped from 82.7 to 78.6 percent. This low mortality from brownspot during the initial grass stage is in line with Siggers' observation that at least three successive annual defoliations by brownspot are required to kill a seedling (*3*). Severe defoliation seldom develops in a plantation before the second or third year.

Fertilizer very significantly reduced survival under all site conditions (Table 1). Survival of fertilized seedlings averaged 75.7 percent for all site treatments combined, as compared to 85.6 percent for unfertilized seedlings. Even though the fertilizer was placed in a restricted zone to minimize its effect on competing vegetation, a lush growth of weeds and grasses developed in the first year. This heavy competition increased pine mortality somewhat, but it is probable that the fertilizer also injured the seedlings directly. In June of the first year, before vegetative competition became severe, survival was 83.9 percent for fertilized seedlings and 91.5 percent for unfertilized ones. Also, June survival in one of the supplemental tests declined as the fertilizer dosage was increased from 0 to a level twice that used in the main test. The other supplemental test suggested that inorganic elements in the mixed fertilizer were responsible for this initial mortality. Organic nitrogen in the form of cottonseed meal did not affect seedling survival, nor did it stimulate the growth of competing vegetation.

Growth

The effect of treatment on seedling growth was measured after the fourth year by classifying all vigorous seedlings into two groups. Those in active height growth—with stem length exceeding four inches—were represented by vigor class 1. Class 2 denoted grass-stage seedlings that had attained the necessary size and bud characteristics to begin active height growth in the fifth year.

Nearly half of all surviving seedlings on the untreated plots were in active height growth by the end of four years, and another third had the necessary size to start growth in the following season (Table 2). Site preparation by furrowing, disking, or burning did not alter these results very much, and none of the differences between site treatments were significant.

As can be noted in Table 2, the split-plot design resulted in an interaction between site treatment and fertilizer. Hence, the effect of site treatment on height growth can be evaluated best from the results on plots not fertilized. There, burning ranked first among site treatments when tested without

TABLE 2.—PROPORTION OF SURVIVING SEEDLINGS IN VIGOR CLASS 1 AND 2 AFTER 4 YEARS, BY TREATMENTS

Site treatment	Vigor class	Fertilized		Not fertilized		Average
		Sprayed	Not sprayed	Sprayed	Not sprayed	
		Percent				
Heavy rough (check)	1	43.1	38.5	58.3	51.7	48.2
	2	42.7	27.6	32.5	26.6	32.5
		85.8	66.1	90.8	78.3	80.7
Furrowing	1	70.8	46.8	67.1	36.2	55.8
	2	25.1	21.9	21.2	21.5	22.4
		95.9	68.7	88.3	57.7	78.2
Disking	1	43.8	29.5	63.3	48.0	46.8
	2	42.9	44.0	29.5	30.9	36.5
		86.7	73.5	92.8	78.9	83.3
Burning and disking	1	32.2	27.8	55.9	43.3	40.9
	2	39.6	33.0	29.3	23.9	31.0
		71.8	60.8	85.2	67.2	71.9
Burning	1	33.5	26.4	64.7	53.5	45.6
	2	40.8	35.1	26.7	29.3	32.5
		74.3	61.5	91.4	82.8	78.1
All site treatments	1	45.5	33.9	61.8	46.6	47.5
	2	38.0	32.3	27.9	26.4	30.9
		83.5	66.2	89.7	73.0	78.4

TABLE 3.—PROPORTION OF VIGOR CLASS 1 AND 2 SEEDLINGS WITH MORE THAN 50 PERCENT BROWNSPOT INFECTION AFTER 4 YEARS

Sub-plot treatment	Rough check	Furrows	Disked	Burn-disk	Burn	Average
Sprayed	*Percent*					
Fertilized	4.3	5.1	4.3	4.2	0.6	
Not fertilized	5.2	8.5	6.5	5.7	5.1	
Average	4.8	6.8	5.5	5.1	3.3	5.2
Not sprayed						
Fertilized	40.6	66.2	53.1	50.0	43.0	
Not fertilized	55.7	79.7	59.3	56.7	59.7	
Average	49.0	72.8	56.3	53.8	53.3	56.6

spraying, and second to disking where brownspot was controlled.

Without spraying, site treatments in which the grass rough was left intact or disked into the soil produced more growing trees than either furrowing or disking on a burn, which are treatments that expose considerable mineral soil in the first year. This points up the dilemma in site preparation for longleaf. Practical methods of reducing competition expose mineral soil and accelerate brownspot infection, thereby counterbalancing the benefits of the site treatment. When brownspot is controlled with a spray, mechanical site preparation to reduce grass competition will increase growth somewhat, although in this test differences were not significantly better than planting on a heavy grass rough.

The fertilizer, by stimulating weeds and grasses, reduced growth of planted longleaf significantly in all site treatments except furrowing (Table 2). Fertilized seedlings planted in the furrows remained relatively free of close grass competition, whereas those planted on burned, disked, or check plots were buried under a rank growth of herbage. Of the surviving fertilized-sprayed seedlings on furrowed plots, nearly 96 percent were vigorous after four years, as compared to 88 percent for unfertilized-sprayed seedlings in furrows. This indicates a slight response to fertilizer where competition was most effectively controlled, but not enough to justify the cost of fertilizer.

Four applications of Bordeaux spray was the only treatment that significantly improved seedling growth. Spraying substantially increased the proportion of vigorous seedlings on all plots that did not receive the detrimental fertilizer treatment. After four years, nearly 90 percent of the sprayed seedlings were either in active height growth or ready to start, while the average for unsprayed seedlings was 73 percent.

The beneficial effect of spraying was most pronounced on furrowed plots. Conversely, the low vigor of unsprayed seedlings on the furrows reflected the accelerated build-up of brownspot infection that usually occurs on denuded soil. Eight months after the final spraying, less than 6 percent of sprayed seedlings within the two highest vigor classes on all site treatments were severely infected, whereas more than 56 percent of class 1 and 2 unsprayed seedlings were in that category (Table 3).

That sprayed seedlings were able to grow out of the brownspot infection zone was revealed in an examination during the seventh year. Sprayed seedlings on the check plots had produced 748 trees per acre in active height growth and beyond danger of brownspot defoliation. In contrast, only 316 trees per acre on the unsprayed sub-plots were in active height growth (Fig. 1). The ratio between seedlings out of danger on sprayed and unsprayed plots is almost exactly the same as that reported by Wakeley and Muntz in a previous study in which brownspot was controlled by prescribed burning instead of by spraying (*4*).

Because of geographical and seasonal variations in the severity of brownspot infection, no conclusions can be made about the performance of a fixed spraying schedule. Efficiency in this test was improved by three dry years. Seasons more favorable for the development and spread of brownspot spores might require more spray applications; and, conversely, on areas where the brownspot hazard is low, less spraying might be needed for satisfactory control.

Conclusions

In a study in central Louisiana, pre-planting site treatments had little or no effect on either survival or early growth of planted long-

FIG. 1.—*Left:* While in the grass stage, these trees were sprayed with Bordeaux to control the brownspot needle disease. Now, at age 7 years, they are nearly 10 feet tall. *Right:* Unsprayed 7-year-old seedlings on the same plot are mostly still in the grass.

leaf pine. Site treatments included furrowing, disking, burning, followed by disking, and burning alone. Check plots were in a 5-year-old grass rough.

Spraying the seedlings with Bordeaux controlled the brownspot needle blight and thereby improved growth very significantly in four years. Two spray treatments in the second year and annual spraying in the third and fourth years kept severe infection down to 5 percent, and enabled more than 75 percent of the surviving stand to start height growth in the fourth and fifth year. Without spraying, 1,280 planted seedlings per acre failed to make a satisfactory stand. The contrast between sprayed and unsprayed trees duplicated one previously reported in connection with similar control of brownspot by prescribing burning (*4*).

Fertilizer applied during planting reduced survival significantly, and failed to improve growth except on furrowed plots where competition was most effectively removed. There was evidence of direct fertilizer injury, because mortality of fertilized seedlings rose within three months after planting. However, the detrimental effect of fertilizer was mostly indirect — through the stimulation of competing weeds and grasses.

This study has demonstrated the importance of brownspot control in longleaf plantation management. With adequate control average planting stock is capable of starting uniform height growth within three to five years after planting. Failure to keep brownspot infection in check invariably results in ragged, understocked plantations.

Literature Cited

1. PESSIN, L. J. 1938. The effect of vegetation on the growth of longleaf pine seedlings. Ecol. Monog. 8:115-149.
2. SIGGERS, P. V. 1932. The brown-spot needle blight of longleaf pine seedlings. Jour. Forestry 30:579-593.
3. ————. 1944. The brown spot needle blight of pine seedlings. U. S. Dept. Agric. Tech. Bul. 870, 36 pp.
4. WAKELEY, P. C. and H. H. MUNTZ. 1947. Effect of prescribed burning on height growth of longleaf pine. Jour. Forestry 45:503-507.

America's Natural Resources

The book, *America's Natural Resources*, an announcement of which appears on page 350 of this issue, may be purchased by readers of the JOURNAL at a discount of ten percent from the publisher's list price of $3.75. Orders, accompanied by remittance, should be placed through the Society of American Foresters, 425 Mills Building, Washington 6, D. C.

Volume Determinations from Aerial Stand Volume Tables And Their Accuracy[1]

H. A. Meyer
and D. P. Worley[2]

THE TIME REQUIRED to determine the cubic foot volume of a plot from suitable aerial photographs may be as little as one tenth the time required to measure the same plot on the ground. Aerial cruising then could become an important method of forest volume determination provided the accuracy of the aerial measurements is comparable with that of a ground cruise. The various sources of error which affect the accuracy of an aerial photo cruise are (1) the errors of photo measurement, (2) the error of estimate of the aerial stand volume table, and (3) the sampling error of the selected plots. Both the photo measurements and aerial stand volume tables are affected by systematic errors as well as by accidental errors. Since accidental errors can be reduced by repeated measurements or by increasing the number of plots while systematic errors cannot be reduced in this manner, it becomes important to segregate the systematic from the accidental errors. The magnitude of the various errors largely determines the possibilities and advantages of aerial cruising as compared with ground cruising. This paper presents results of detailed studies carried out in upland oak forests for which high quality photographs (infra-red film with minus blue filter at scale of 1:12,000) were available.

[1]Authorized for publication on September 27, 1956 as paper No. 2094 in the Journal Series of The Pennsylvania Agricultural Experiment Station.

[2]Prior to his death December 3, 1955, Dr. H. A. Meyer was professor of forestry at Pennsylvania State University. Mr. D. P. Worley is presently assistant professor of forestry at Penn State. Many of the basic formulae were derived by the senior author before his death.

Errors of Photo Measurement

Studies made to determine the accuracy of aerial photo measurements which are required for volume determination purposes clearly indicate the importance of systematic as well as accidental errors (*2*, *3*). While the magnitudes of accidental errors are to a certain extent dependent upon the skill of the photo interpreter, they have been determined within reliable limits for experienced interpreters.

The standard error of photo height measurements varies from a minimum of about five to a maximum of about ten feet depending upon conditions of measurement and the skill of the photo interpreter. The volume table used in this work requires the average height of the three tallest trees on a 1/5 acre plot. This necessitates making three height measurements on each plot; hence their average would be affected by a standard error of between $5/\sqrt{3}$ and $10/\sqrt{3}$, or 3 to 6 feet. The standard error of relative crown cover was found to be consistently equal to 10 percent. Current local practice dictates that each plot measurement be the result of two estimates of crown closure, thus reducing the standard error to $10/\sqrt{2}$ or 7 percent. Knowing the equation expressing the volume per 1/5 acre plot in terms of stand height and relative crown cover, it is possible to calculate the standard error in volume due to these measurement errors. Our stand volume table is given by the equation:

$$V = -5.634\ C + 0.1364\ HC$$

in which

V = cubic foot volume per 1/5 acre plot in trees 7" and larger
C = relative crown cover in percent
H = stand height (average height of 3 tallest trees) in feet

The variance s_v^2 due to errors s_c and s_h made in measuring the variables C and H is then

$$s_v^2 = (-5.634\ s_c)^2 + (0.1364H\ s_c)^2 + (0.1364C\ s_h)^2 = (31.7 + 0.0186H^2)\ s_c^2 + 0.0186C^2\ s_h^2$$

Assuming standard errors in height measurements of 3 and 6 feet and in relative crown cover of 7 percent, calculated errors of plot volumes for different stand heights and relative crown cover percents are shown in Table 1.

Table 1.—For the range of values shown the standard error of plot volume due to accidental errors in photo measurements amounts to between 60 and 130 cu. ft. per plot. A direct determination of the errors in volume may be made from repeated measurements of a number of plots by different interpreters. The results of such an experiment in which 24 plots were measured twice by six different interpreters are summarized in Table 2.

Table 2.—The conditions of measurement were such that a week or more elapsed between the first and second sets of observations so that it is felt that they are independent of each other.

An inspection of the average plot volumes obtained by the different interpreters shows that the differences between observations for each interpreter are much smaller than the differences among interpreters. This indicates that serious systematic errors are probably present or that the variation from one interpreter to another is high. The analysis of variance of this data is presented in Table 3 and it confirms this impression.

Table 3.—Both the variation due to plots and the variation due to interpreters prove to be significant when compared to the interac-

TABLE 1.—STANDARD ERRORS OF PHOTO VOLUMES ON 1/5 ACRE PLOTS DUE TO ACCIDENTAL ERRORS OF PHOTO MEASUREMENTS

Stand height	Crown cover percent					
	40		70		100	
Feet	$s_e = 7$ *percent*		$s_e = 7$ *percent*		$s_e = 7$ *percent*	
	s_h 3 ft.	s_h 6 ft.	s_h 3 ft.	s_h 6 ft.	s_h 3 ft.	s_h 6 ft.
40	57	64	62	79	68	99
70	79	84	83	96	88	113
100	104	108	107	118	111	132

TABLE 2.—AVERAGE PLOT VOLUMES OBTAINED FROM AERIAL VOLUME DETERMINATIONS ON TWENTY-FOUR 1/5 ACRE PLOTS

Interpreter	Observation 1	Observation 2	Average
	Cu. ft.		
1	345	336	340
2	284	299	292
3	249	236	242
4	269	274	272
5	361	271	316
6	358	342	350
Average	311	293	302

Actual average volume = 314 cu. ft. per plot.

tion term with the F test. It can be concluded then that different interpreters do create serious systematic errors.

The variation within pairs of observations, however, is small, producing a standard deviation of only 63 cubic feet per plot. From this it is evident that a single interpreter's measurements, within the time of a week or so, are relatively consistent.

The standard deviation of plot volumes as computed from the inter-action term includes a portion of the unaccountable plots × interpreters' error as well as the within pairs error. This can be called the accidental error of plot volume determination and it amounts to ±71 cubic feet per plot.

Since the average volumes in Table 2 were a result of 48 observations, the standard deviations among them if unaffected by systematic errors would be $71/\sqrt{48} = 10$ cubic feet but by actual computation they are equal to 42 cubic feet or more than four times as great. The presence of systematic errors of such magnitude makes it necessary to determine the systematic error of each interpreter from an adequate ground control cruise. Most of the heights in this test were between 60 and 80 feet and the crown cover percents between 60 and 90. These values will yield volume errors due to accidental errors of measurement of between ±65 to ±85 cubic feet per plot. The accidental error in this test of ±71 cubic feet per plot is within these limits. By repeated measurement of tree height and crown cover percent on each plot the accidental error in plot volume can be reduced at will. Since the error in height measurement contributes more to the volume error (Table 1), a duplication of each height measurement as well as the duplication of crown cover measurements seems advisable. The standard error of plot volume then would seldom exceed 60 cubic feet per plot and further reduction in the error of photo measurements would be of little value as will be shown presently.

The Error of Estimate of the Aerial Stand Volume Table

The standard error of estimate of the aerial stand volume table used in this investigation is equal to 113 cubic feet per 1/5 acre plot (*1*). This error, independent of the errors of photo measurement, is due to differences in forest stands which are characterized by the same height and crown cover percent. As a result, the total error in estimating plot volume then must include both the error due to photo measurement and the error of estimate of the volume table as follows:

$$s_p = \sqrt{s_m^2 + s_e^2}$$

in which

s_m = standard error of plot volume due to errors of measurement
s_e = standard error of plot volume due to error of estimate
s_p = total standard error of calculated plot volume

For a standard error due to measurement s_m of 60 cubic feet and the error of estimate s_e of 113 cubic feet, the total standard error of the calculated plot volume s_p becomes 128 cubic feet per plot. Since the standard error of estimate of the aerial stand volume table is fixed at 113 cubic feet per plot little would be gained by reducing the standard error due to measurement to less than say 60 cubic feet.

Correction of the Systematic Error of Plot Volume Determination Through Ground Control

Ground control of an aerial cruise is obtained by measuring a certain number of randomly selected photo plots on the ground. These are used to determine a correction factor to eliminate the systematic, or among interpreters, error of a photo cruise. On a large area this does not represent a serious obstacle to photo cruising since some ground measurements must be taken in any event to determine growth, species, defect, etc. The utmost care should be used to secure the accurate location of the control plots. Errors arising in plot location are of minor importance in homogeneous stands but may be serious in irregular stands.

For the sake of simplicity, assume that the correction factor eventually determined is the same

TABLE 3.—AN ANALYSIS OF VARIANCE OF PLOT VOLUMES OBTAINED IN A PHOTO CRUISE MADE BY 6 DIFFERENT INTERPRETERS

Source of variation	Sum of square	Degrees of freedom	Mean square	F
Among plots	606,941	23	26,389	5.2
Among interpreters	440,551	5	88,110	17.4
Interaction P × I	582,611	115	5,066	
Total between pairs of plot observation	1,630,103	143	11,399	
Within pairs of plot observations	566,597	144	3,936	
Total	2,196,700	287		

for plots of different volume so that it can be expressed as:

$$f = \frac{V_a}{V_p}$$

in which

f = the correction factor
V_a = average actual volume of the control plots
V_p = average photo volume of the control plots

The actual volume of the control plots can be considered free of error for a given volume table applied to a forest, site class, or timber type (in terms of the volume table applied at any rate).

The error of the average photo volume of the control plots depends upon the error of a single photo plot and the number of control plots. Since the standard error of the photo volume of a single plot s_p has been found to be 128 cubic feet for plots of average volume the error of the average photo volume of a number (N) of these is equal to:

$$s_{\bar{p}} = \frac{128}{\sqrt{N}}$$

Where $s_{\bar{p}}$ is the standard error of V_p
Since

$$f = \frac{V_a}{V_p}$$

We have by law of the propagation of errors

$$s_f = s_{\bar{p}} \cdot \left(\frac{V_a}{V_p^2} \right)$$

Since $\quad s_{\bar{p}} = \frac{128}{\sqrt{N}}$

and $\quad V_a = f(V_p)$

then $\quad s_f = \left(\frac{128}{\sqrt{N}} \right) \cdot \left(\frac{f}{V_p} \right)$

Solving this equation for N we have

$$N = \left[\left(\frac{128}{V_p} \right) \cdot \left(\frac{f}{s_f} \right) \right]^2$$

for a stipulated value of s_f of say 0.05, the number of control plots required can be determined for different photo volumes and different values of f as shown in Table 4.

It is apparent that fewer control plots are needed to secure the desired accuracy for large plot volumes than for low plot volumes. In general the number will be between 30 and 150 plots. Trial calculations of the factor f in any particular case will reveal how many plots are required.

TABLE 4.—NUMBER OF CONTROL PLOTS REQUIRED TO PRODUCE AN s_f OF 0.05 FOR DIFFERENT VALUES OF f AND DIFFERENT PLOT VOLUMES

Average photo volumes per 1/5 acre plot	Values of f		
	0.8	1.0	1.2
Cu. ft.	*No. of plots required*		
200	104	163	231
300	59	72	104
400	26	40	60
500	17	26	38

The Sampling Error of a Photo Cruise

A photo cruise like any other is affected by ordinary sampling errors. These errors combine with the accidental errors of measurement, with the error of estimate and the error of the correction factor so that if s_c represents the sampling error of a cruise made up of individual 1/5 acre plots the total standard error s of estimating a single plot volume is equal to:

$$s = \sqrt{f^2(s_{\bar{p}})^2 + p^2(s_f)^2 + s_c}$$

Within a relatively homogeneous forest, stand, strata, compartment, or block the coefficient of variation for 1/5 acre plots of average volume may vary between 20 and 40 percent. These values correspond to coefficients of variation of 10 to 20 percent for volumes from 1-acre plots. Considering that s_c may be equal to 30 percent for an average plot volume of, say, 300 cubic feet, s_c would equal 90 cubic feet. Assume for the sake of illustration that $f = 1.0 \pm .05$. The total standard error of volumes of a 1/5 acre plot in a photo cruise will equal

$$s = \sqrt{1^2(128)^2 + 0.05^2(300)^2 + 90^2} = 157 \text{ cubic feet.}$$

It is interesting to note that with fixed values of s_m and s_c the sampling error s_c can vary considerably without altering, to any great extent, the total standard error of the volume estimate of a single plot. Of greater importance is the fact that the standard error between plot volumes determined from the aerial photographs will be nearly double that determined from a well designed ground cruise. This will necessitate measuring 3 to 4 times more plots on the photographs than on the ground in order to make the cruising error comparable in each case.

From these facts and the foregoing discussion of ground control it is evident that small forest areas with low coefficients of variation can often be cruised with fewer plots than are required for the ground control of a photo cruise. The advantages in time and money of direct volume determination from aerial photgraphs will be had only on large tracts.

An Aerial Photo Cruise

The Pennsylvania State University School of Forestry manages a 6,000-acre research forest 15 miles south of University Park. The timber types are slightly different and the soils are markedly different from the area which furnished the data for the volume table previously cited. One block of this tract comprising 388.6 acres of timber has been 100 percent ground cruised by compartments for management research purposes. It was felt that this would form an excellent check of aerial photo cruise control and offer an opportunity to test the principles of aerial cruising which have been developed in the early parts of the paper.

The timber stands in the vicinity average about 1,500 cubic feet per acre or 300 cubic feet per plot. The accidental errors involved in aerial photo plot volume determination are as shown before: $s_m = \pm 60$ cubic feet per plot and $s_c = \pm 113$ cubic feet per plot making $s_{\bar{p}}$, the standard error of individual plot volume, equal to ± 128 cubic feet. An initial assumption was made about the correction factor f, that

$$f = \frac{V_a}{V_p} = 1$$ and it was decided

to determine f with an allowable error of 0.05. In order to determine f with this degree of accuracy we must compute the number of control plots required.

$$N = \left[\left(\frac{s_p}{V_p}\right)\cdot\left(\frac{f}{s_f}\right)\right]^2$$

$$= \left[\left(\frac{128}{300}\right)\cdot\left(\frac{1.00}{0.05}\right)\right]^2$$

$$= (8.5)^2$$
$$= 72 \text{ plots}$$

Seventy-four plots were chosen to be measured both in the field and on the aerial photographs. These plots were systematically selected on the aerial photographs so as to encounter all of the conditions found not only on this block but also on two adjoining blocks. In practice, superior technique would require that the control plots form a sub-sample of the plots used for the photo cruise. The data from these plots were shown graphically in Figure 1.

Using these data $f = \frac{V_a}{V_p} =$ 1.1024. The pertinent statistics of this relationship follow:

$$s_{V_a} = \pm 83 \text{ cubic feet}$$
$$s_{V_p} = \pm 98 \text{ cubic feet}$$
$$s_{V_aV_p} = \pm 54 \text{ cubic feet}$$
$$S_f = \pm 0.02$$

From these it is seen that the standard error of f falls well within the allowable error and no further plots need be measured for control.

As a preliminary test photo cruises were made on the individual compartments comprising the block. They were cruised taking photo plots at convenient intervals following a systematic design and were analyzed by comparing the actual errors obtained with the errors to be expected, which depends on the number of plots which were measured. The results of these preliminary tests are shown in Table 5.

It is interesting to note from Table 5 that the adjusted photo volumes for all eight compartments are reasonable estimates of the actual volumes in light of the errors to be expected. Furthermore, it is evident that the photo volumes are generally low. This it is felt is due partly to the fact that the correction factor f was not determined by subsampling these compartments individually but was instead a correction factor for the entire block. It must be pointed out, however, that the correction factor f cannot be far wrong for any of the compartments since the errors produced are not out of line.

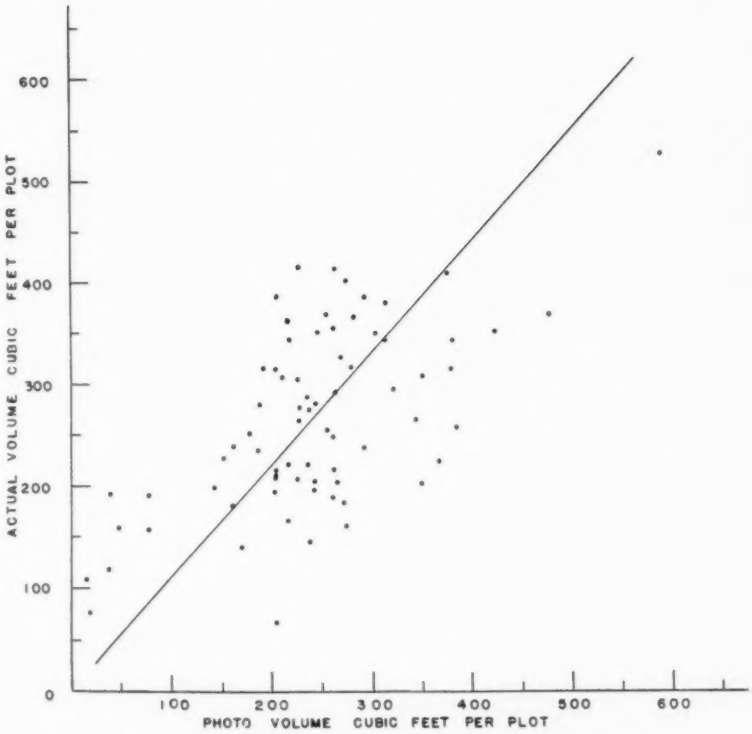


FIG. 1.—The data used for computing the correction factor f.

The next step was to make an independent aerial photo cruise of the entire block. It was desired to permit an allowable error of 0.05. The estimated error of the volume on a plot in a photo cruise depends upon the error of plot volume determination, the standard deviation of the sampling error, and the error of the correction factor so that:

$$s = \sqrt{1.1^2(128)^2 + 0.02^2(300)^2 + 90^2}$$
$$= \pm 167 \text{ cu. ft. per plot}$$

Hence for an average volume of 300 cubic feet the coefficient of variation of such a cruise would be equal to:

$$C \text{ of } V = \frac{s}{V_a} = \frac{167}{300} = .55$$

The number of plots required to attain the allowable error (AE) would be:

$$N = \frac{(C \text{ of } V)^2}{(AE)^2} = \frac{(.55)^2}{(.05)^2} = 121 \text{ plots}$$

One hundred and twenty-one plots were measured on the aerial photographs. The average volume

TABLE 5.—THE RESULTS OF AERIAL PHOTO CRUISES MADE FOR THE INDIVIDUAL COMPARTMENTS OF A LARGER FORESTED BLOCK

Comp. no.	Actual ave. vol. per plot	No. of photo plots	Average aerial photo volumes		Actual error of adjusted vols. (act.-photo)	Expected error (Sx)
			Unadjusted	Adjusted (ratio = 1.10)		
	Cu. ft.		*Cu. ft. per plot*			
1	309	20	297	326	−17	35
2	389	21	335	368	+21	35
3	382	23	293	322	+60	35
4	358	26	294	324	+34	30
5	316	18	278	306	+10	40
6	368	40	297	327	+41	25
7	214	17	194	213	+ 1	40
8	197	23	189	208	−11	35

per plot was determined and adjusted using the correction factor $f = 1.10$ with the results shown below.

Unadjusted average photo volume per plot	316 cu. ft.
Correction factor (f)	1.10
Adjusted average photo volume per plot	348 cu. ft.
Actual average volume per plot from 100 percent cruise	335 cu. ft.
Actual error (Act-photo)	−13 cu. ft.
Allowable error (0.05)	±16.75 cu. ft.

Summary

1. Aerial photo cruising, though many times faster than conventional ground cruising methods, is subject to both accidental and systematic errors. Of these the systematic errors are the most serious, amounting to as much as four times the accidental errors.

2. Because of the systematic errors it is necessary to use ground control in aerial photo cruises. By ground control is meant measuring on the ground a certain number of aerial photo plots. From data thus gathered a correction factor is computed to compensate for the systematic error.

3. The number of control plots required to produce a correction factor within the limits of a particular allowable error can be computed. Under the conditions outlined in this paper it will require from 30 to 150 plots to compute a correction factor with an accuracy of ±5 percent. The actual number depends upon the value of the factor and the average photo volume per plot.

4. When making the actual photo cruise the coefficient of variation must include the sampling error as well as the errors associated with the photo estimates of plot volume. This results in a coefficient of variation nearly twice that of the ground cruise, requiring the photo measurement of three to four times as many plots to obtain an accuracy commensurate with that of a ground cruise.

5. It becomes clear that, under the conditions governing these tests, small areas with a low coefficient of variation can be ground cruised with fewer plots than would be required to ground control a photo cruise of the same area.

6. It is equally clear that, when applied to large areas, direct volume determination from aerial photographs to a predictable accuracy is both practical and economical.

Literature Cited

1. GINGRICH, S. F., and H. A. MEYER. 1955. Construction of an aerial stand volume table for upland oak. Forest Science 1:140-147.
2. WORLEY, D. P., and G. H. LANDIS. 1954. The accuracy of height measurements with parallax instruments on 1:12,000 photographs. Photogrammetric Engineering 20:823-829.
3. ———, and H. A. MEYER. 1955. Measurements of crown diameter and crown cover and their accuracy for 1:12,000 photographs. Photogrammetric Engineering 21:372-374.

Surface Runoff and Erosion as Related to Prescribed Burning[1]

H. H. Biswell and A. M. Schultz
University of California, Berkeley

THE IMPROVEMENT OF game habitat in second-growth ponderosa pine through prescribed burning has been under study in California for the past five years[2]. One of the principal benefits gained from burning has been that of reducing danger from wildfires in summer (*1, 2*). Some of the burning has been done on slopes as steep as 43 percent. This has caused some people to wonder if it accelerates runoff and erosion. During the 1955-1956 season very heavy rains falling on burns of different ages and on slopes of different degrees afforded an opportunity to survey indicators of runoff and erosion as related to the prescribed burning. The observations were based on qualitative criteria, something like those described by Gleason in "Indicators of erosion on watershed land in California" (*3*).

Fortunately, within the same areas as those prescribed burned are a state highway, private roads, a bulldozer fire lane, a power line right-of-way cleared to mineral soil, and bare skid trails from recent logging. One skid trail going straight down a 30 percent slope was partly bare, partly covered by natural needle fall, and partly covered with needles placed by hand. All of these various situations within a relatively small area made an ideal set-up for comparisons.

The results are based on qualitative criteria and are given with the thought that they should be helpful to watershed specialists or others who might have an opportunity to make more detailed studies related to this kind of work. Up to the present time, such studies have not been made. Studies nearest to the subject are those reported by Rowe and Colman (*4*); however, their burning techniques were different than those we used, consequently, their results do not apply to our observations.

Our work was done at Hoberg's in the Coast Ranges of northern California on Salminas gravelly loam. This soil is formed in place from andesitic and related igneous rocks. It is slightly to moderately acid and has a depth of 3 to 4 feet with very little differentiation in the profile. The soil is moderately permeable and well drained. In this area the seasonal precipitation is normally about 60 inches but during the 1955-1956 season it was 75

[1]A portion of this research was done under Federal Aid in Wildlife Restoration Act, Project California W-51-R.

[2]Prescribed burning is defined as the application of fire to forest lands under such conditions of weather, soil, moisture, time of day, and other factors as presumably will result in the intensity of heat and spread required to accomplish specific silvicultural, wildlife, grazing, or fire-hazard reduction purposes.

FIG. 1.—Needles and partially decomposed duff remaining after four prescribed burns: December 1951, March 1954, March 1955, and March 1956. Although this is slope of 33 percent, the cover combination of tree canopy + annual needle fall of about 2000 lbs. per acre + partially decomposed duff and debris, was effective in preventing apparent surface runoff. Photo. June 8, 1956.

FIG. 2.—This area with slope of 20 to 25 percent gradient was prescribed burned on February 11, 1956 before the heavy rain storm of 20.71 inches later in the month. No indication of surface runoff appeared after the storm. Rains have leached the black ash so that one can scarcely see that the area has been burned. Photo. June 8, 1956.

inches from September 14 to April 30.

Two very heavy rain storm periods occurred during that season; one in December of 35.61 inches in 12 days, another in February of 20.71 inches in 7 days. The distribution of precipitation by days during these two storms is shown by the following figures. Data on maximum intensity for shorter intervals of time are not available.

DECEMBER 1955

Date	*Ppt. (inches)*
16	.27
17	.43
18	.75
19	12.72
20	6.05
21	1.26
22	6.46
23	3.67
24	.66
25	.46
26	2.16
27	.72
Total	35.61

FEBRUARY 1956

Date	*Ppt. (inches)*
19	1.45
20	4.35
21	5.53
22	6.17
23	1.82
24	.27
25	1.12
Total	20.71

The techniques of prescribed burning in second-growth ponderosa pine in California were described by Vlamis, Biswell, and Schultz in the December 1955 issue of the JOURNAL (*5*). The burning is done in the fall, winter, and early spring after rainfall, and when the top needles are dry but the lower duff and the mineral soil are wet. Under these conditions the fires usually consume about half of the needles and duff and leave half. For example, in an area where the needles and duff weighed 22,866 lbs. per acre before the fire they weighed 10,375 lbs. after prescribed burning. Even after two or three burns in successive years an appreciable amount of duff and debris remain above the mineral soil (Fig. 1).

Most of the prescribed burning has been done under a canopy of ponderosa pine where a few black oaks were intermixed. However, in one case the brush—mostly nonsprouting manzanita—on a small area of about one-half acre was pushed over by bull-dozer and burned after it was dry. The latest burning before the December storm in 1955 was done in March and early April of that year and on slopes up to 43 percent. The latest burning before the February storm was a few days earlier, February 11, on slopes ranging mostly between 20 and 25 percent (Fig. 2). On the areas burned in March and April before the December storm a needle crop of about 1,500 lbs. per acre had fallen in September, October, and November. This crop of needles covered about 65 percent of the ground as determined by the point analyzer method. On older burns the needle cover was more complete and nearly 100 percent.

On the area burned a few days before the February storm most of the fresh needles had been consumed by the fire and only the underlying duff and needles that normally remain after prescribed burning were left on the mineral soil. This underlying layer was about one-half inch deep and covered about 95 percent of the ground surface.

In places where surface water ran from trails onto freshly burned areas, the evidence of runoff showed as drifted duff and fine debris. Where the runoff was more severe, particularly where the water came from a wide asphalt road, the duff and pine needles were completely washed aside and the soil surface left bare. These concentrated flows were dispersed after flowing a short distance through duff and needles.

The principal observations of

surface runoff and erosion as related to prescribed burning and the other situations described above may be briefly stated and summarized as follows:

1. There was no indication of surface runoff and erosion following prescribed burning that could be related to the burning itself, even after abnormally heavy rains on fresh ash. Also, there was no evidence of runoff on a small area of about one-half acre where the brush had been pushed over and burned after it was dry even though the ground was nearly bare except for ash. Evidence of runoff was observed in numerous places over the forest but in every case its origin was in areas bared by roads, in bulldozer trails, etc., as explained more fully in item 3 below.

These observations are in line with those of Weaver (*6*) who emphasized that no accelerated soil erosion had been identified as traceable to prescribed burning in ponderosa pine on the Fort Apache Indian Reservation in Arizona.

2. Partially decomposed duff and debris remaining after prescribed burning was effective in maintaining high infiltration and percolation capacity. It must be concluded that the water went into subsurface flow and deep seepage. This is favorable to flood prevention during intense storms.

3. Surface runoff was clearly indicated to have taken place from roads, bulldozed lanes, right-of-way cleared to mineral soil, and bare skid trails running directly down slopes. The surface of bare mineral soil seemed to be sealed by raindrop splash, and in abnormally heavy storms very small bare areas gave rise to pronounced runoff. This would lead one to conclude that great care should be taken in locating and maintaining roads and fire lanes, and in using equipment in ways that bare the soil. Pine needles scattered over a skid trail were effective in protecting the soil against erosion.

4. Results thus far indicate that ponderosa pine stands in this area and soil type can be prescribed burned perhaps every four or five years and a partially decomposed duff cover maintained, sufficient for high infiltration and percolation capacity and prevention of accelerated runoff and erosion.

5. The main problems in runoff and erosion in such timber covered areas as those described above appear to be connected with practices that give rise to bare soil.

Literature Cited

1. BISWELL, H. H., and A. M. SCHULTZ. 1956. Removal of tinder in ponderosa; prescribed burning of forest brush during the wet season by tested methods effectively reduces hazard of wildfire. Calif. Agriculture 10(2):6-7.
2. ————, and ————. 1956. Reduction of wildfire hazard; correct timing of prescribed burning of dead vegetation in timber reduces danger of uncontrolled fires in those areas. Calif. Agriculture 10(11):4-5.
3. GLEASON, CLARK H. 1953. Indicators of erosion on watershed land in California. Transactions, American Geophysical Union. 34: 419-426.
4. ROWE, P. B., and E. A. COLMAN. 1951. Disposition of rainfall in two mountain areas of California. U. S. Dept. Agric. Bul. 1048:1-84.
5. VLAMIS, J., H. H. BISWELL, and A. M. SCHULTZ. 1955. Effects of prescribed burning on soil fertility in second growth ponderosa pine. Jour. Forestry 53: 905-909.
6. WEAVER, HAROLD. 1955. Fire as an enemy, friend, and tool in forest management. Jour. Forestry 53: 499-504.

1956 Lumber Production

The nation's sawmills produced 37.5 billion board feet of lumber during 1956, enough to build about 3.8 million three-bedroom homes, according to the National Lumber Manufacturers Association. While this figure was four percent below the 1955 production volume, it exceeded average yearly output since the end of World War II by 2.5 percent.

About a third of last year's lumber production went into home construction. Softwood production, mainstay of home building, totaled 30 billion board feet—4.9 percent below the previous year's output. The fact that softwood output declined less than housing starts—off 15.7 percent—may be due in part to an increase in home sizes and greater use of wood per dwelling unit, according to the association.

Hardwood production last year equaled 1955's output of 7.5 billion board feet. Primarily credited for this stability was a strong demand for hardwoods used in furniture manufacture.

Notes

Determining Fire Prevention Goals

WHAT GOALS for forest-fire prevention are consistent with overall fire control policy? This question must be answered before prevention can be integrated into the planning and normal operation of the fire-control team (*8*).

A stated objective of fire control is to hold annual damage, measured in terms of burned acreage, below a specified level (*7*). This can be accomplished by preventing fires from starting and by prompt and effective suppression of all fires that start. The allowable limits are determined by the loss that can be sustained without disrupting management plans. Even occasional failure to meet this objective can seriously hamper orderly forest management.

Now, we know that a fire on a high danger day will burn more acreage than a fire on a low danger day (*1, 6*). Therefore more emphasis should be given to prevention activities during periods of high danger than when danger is low. Any prevention goal should recognize this essential and give greater weight to fires prevented during critical periods. We can meet the burned area goal only if fewer fires than average are allowed in bad years.

A New System of Pars

How can such a "par for the course" be set? A new method is now being tried in Region 5 of the U. S. Forest Service. The region previously rated prevention success on the ability of each national forest to reduce fire occurrence below a given number of fires. The new system, called "prevention par," is based on the probable damage for each class of fire danger.

The probable damage is determined from the relative burned area at each class of fire danger (Table 1). The burned-area figures were determined individually for each national forest from the values given by Countryman (*1*), but for this system the forests were lumped into a Coast Range-Siskiyou group and a Sierra-Southern California group. The differences between burned-area ratios within groups was not significant, but the difference between groups was highly significant.

Each forest computes its prevention score by giving each fire throughout the season a weighted "point" value according to the probable loss for the appropriate fire danger.

The prevention par for the region as a whole is arbitrarily set at the beginning of the year. The par for each forest is determined from its 5-year average percentage of the total regional score. To compute this distribution, the class of fire danger for each fire was read from individual fire reports (Form 929). When the class of fire danger was listed as "unknown" (17 percent of all fires were so listed), the danger for the day of origin was computed from the nearest Weather Bureau station.

Old and New Compared

This system of prevention pars demonstrates fire prevention accomplishments in a way that cannot be done by merely tabulating number of fires. Comparing prevention pars with the number-of-fires score on California's 17 national forests in 1954 and 1955 reversed the record in 11 of the 34 cases. That is, forests that were below par in number of fires exceeded the prevention par, or vice versa.

For example, one forest had 2 percent fewer fires than the suggested goal under the old system. Yet it went over the prevention par by 56 percent. Why this difference? The record shows that prevention activities were more successful in reducing pre- and post-season statistical fires than in preventing fires during periods of high danger. The forest had reduced the number of fires but had made no marked reduction in damage. Another forest exceeded its number-of-fires goal by 28 percent but was 4 percent below par under the new system. In this case an unusual number of off-season fires spoiled an otherwise good fire occurrence record, but damage was not abnormally high.

Conclusion

Why adopt a system of pars that reflects probable damage? For one thing, it helps to integrate prevention into the basic objective of fire

TABLE 1.—RELATIVE AREA BURNED, BY FIRE-DANGER CLASS, CALIFORNIA NATIONAL FORESTS

Fire-danger class	Coast Range-Siskiyou group[1]	Sierra-Southern group[2]
Low	0.1	0.2
Medium	1.0	1.0
High	3.0	3.0
Very high	6.0	8.0
Extreme	10.0	14.0

[1]Klamath, Mendocino, Modoc, Shasta-Trinity, and Six Rivers National Forests.
[2]Angeles, Cleveland, Eldorado, Lassen, Los Padres, Plumas, San Bernardino, Sequoia, Sierra, Stanislaus, and Tahoe National Forests.

control policy rather than leaving it as a separate entity. Also, the system focuses attention on the prevention of fires during periods of high fire danger when the potential for damage is highest. Finally, it avoids tieing the success of a prevention program to the incidence of off-season fires.

This method of rating fire occurrence against a sliding scale, in which fewer fires are allowable in bad years, is directly opposed to several widely used systems for determining prevention effectiveness (*2, 3, 4, 5*). These systems are based on the premise that if prevention effort is held constant, there will be more fires during years of bad fire weather than during easy ones. Therefore, during bad fire years, more fires are "allowable" for a given level of effectiveness. In setting par for the course, however, we must not lose sight of the fact that our objective is an acceptable level of damage. If we are to meet this goal, we must be most effective during bad fire seasons.

Literature Cited

1. COUNTRYMAN, C. M., and P. H. INTORF. 1953. A fire severity index for California National Forests. Calif. For. Range Expt. Sta., Misc. Paper No. 14, 7 pp., illus. [Processed]
2. CROSBY, J. S. 1954. Probability of fire occurrence can be predicted. Cen. States For. Sta., Tech. Paper 143, 14 pp., illus.
3. LINDENMUTH, A. W., and J. J. KEETCH. 1950. A new measure of the severity of fire seasons. Fire Control Notes 11(1):15-19.
4. MITCHELL, J. A. 1954. Rating the effectiveness of fire protection. Jour. Forestry 52:183-5.
5. NELSON, R. M. 1955. The principles and uses of fire danger measurement. Modern Forest Fire Management in the South. La. State Univ. Proc. of the Fourth Annual Forestry Symposium. 1955:37-45.
6. REYNOLDS, R. R., and D. BRUCE. 1940. A check of the Central States fire danger meter. Fire Control Notes 4(2):77-79.
7. SHOW, S. B., and E. I. KOTOK. 1930. The determination of hour control for adequate fire protection in the major cover types of the California pine region. U. S. Dept. Agric. Tech Bull. 209, 46 pp., illus.
8. STATHEM, P. A. 1954. A "prefire" rather than a "presuppression" organization. Fire Control Notes 15 (4):32-37.

CRAIG C. CHANDLER
Forester, California Forest and Range Experiment Station, Forest Service, U. S. Dept. of Agriculture, Berkeley

A Note on Recent Soviet Timber Industry Statistics

This note is intended as an alert to those who may use the recently published *National Economy of the USSR: Statistical Handbook* (in Russian).[1] This book is the first of its kind since the prewar period, and has attracted considerable attention throughout the world. Two of the tables presented relate to the Soviet timber industry. On the basis of several years of research on this subject, the writer wishes to point out three features of these tables which require clarification.

First, figures are presented on the mechanization of labor in the Ministry of the Timber Industry which show that the following shares in the "total volume of completed work" were produced by mechanized means (in percent):

	1940	1950	1954	1955
Timber felling	38.1	83.8	86.1	
Skidding or trailing of timber to upper landing	7.0	30.8	69.4	74.0
Timber haulage (presumably to lower landing)	33.1	58.2	76.7	78.8

These figures reveal an apparently impressive record of technological improvement, but they are misleading in that they represent a small fraction only of total Soviet logging activity. The Ministry of the Timber Industry produces probably no more than about 50 percent of total logging output (industrial and fuel wood) at the present time. The remainder is produced by small, decentralized producers controlled by enterprises (e.g., textile, metallurgy, food, etc.) which require wood in their normal operations and which cannot rely upon wood supplies from the timber ministry.

Second, the operations cited in this handbook table noted above are the so-called basic operations only, i.e., those directly related to the movement of the log from standing timber to shipment point. However, these operations in the last several years have consumed a decreasing share of total logging labor expenditures. The chief cause of this is the fact that in the postwar period greater attention has been devoted to the labor-consuming work of cleaning the felling area (slash removal). On March 16, 1950, the Ministry of Forestry set forth the methods to be used in timber cutting by industrial logging enterprises,[2] and among the stipulations of the act is one which requires disposal of slash immediately after logging. The aim of the law is to enhance forest regeneration and reduce forest fires, and the statute is to be enforced by fines. No such regulations were in existence prior to 1950 except in the watershed protection forests located chiefly in the central and southern areas. With the advent of the 1950 law the total amount of labor required for slash removal became enormous.

In 1956, Orlov, the Minister of the Timber Industry, stated that 60 percent of all workers in the cutting area were occupied in cutting branches.[3] Obviously, "cutting" here includes disposal, for the cutting in itself is a relatively simple operation requiring little time. It is not without significance, perhaps, that a Soviet writer after his visit to a Canadian logging camp commented, somewhat wist-

[1] *Narodnoe khoziaistvo SSSR: statisticheskii sbornik,* Moscow, 1956. All information relating to the timber industry is found on p. 78.

[2] Described in A. P. Grachev, "Pravila rubok glavnogo pol'zovaniia v ravninnykh lesakh SSSR" (Felling Regulations for the Primary Cut in Forests on Level Ground in the USSR), *Lesnoe khoziaistvo* (Forestry), No. 5, 1950, pp. 49-54.

[3] *Lesnaia promyshlennost'* (Timber Industry), April 12, 1956.

fully it seemed, that the camp enjoyed high labor productivity partly because the slash was left untouched. In brief, in 1955 Bulganin stated that 68 percent of all work in the logging industry was still done by hand. It is thus evident that the figures on mechanization relate to less than one-half of total logging labor expenditures within the timber ministry.[4]

The final point requiring clarification relates to another table titled "Haulage of Industrial Timber in the USSR." In using this table the reader is cautioned that the figure cited for the calendar year 1928 of 36,000,000 cubic meters actually refers to the fiscal year 1927-1928 (from the first of October to the end of September). Hence, if this year is considered the initial year in a production time series, an erroneous appearance of rapid growth is obtained. The correct figures for the late 1920's, which are usually cited by Soviet writers, are the following (in millions of cubic meters): 1927-1928—36.0; 1928-1929—54.3; 1929-1930 (including all of 1930)—101.2. Subsequent to this date the Soviet fiscal year corresponds to the calendar year, and the figures cited in the handbook table are correct.

In summary, it may be stated that while the recently published data are most helpful, it is to be hoped that some clarifying figures will be released in the future. The present figures in themselves give only a partial picture of the Soviet timber industry, and unless the reader is cautious, unwarranted conclusions may be drawn from them.

W. DONALD BOWLES
Montgomery, Alabama

[4] *'Lesnaia promyshlennost'*, July 19,1955.

Field Key-Punching of Forestry Data[1]

Forestry applications of electric tabulating machine techniques are increasing greatly, particularly in continuous forest inventory methods.[2] In such applications, one of two general procedures is usually followed in tabulating data.

In one, the data are listed in the field on a form or tally sheet as observations and measurements are made. Later, the data are transferred in the office by the operator of an electric key-punch machine into the IBM tabulating cards. The accuracy of transferring is checked by the process of verification, which consists essentially of repeating the key-punching of the same cards, and thus locating and correcting errors made by the first key-punch operator. When the cards have been key-punched and verified, they are ready for compilation, computation, or analysis as required by the problem at hand.[3]

The other widely used procedure consists of mark-sensing the tabulating cards in the field at the time the observations and measurements are made. Marks with a soft-leaded pencil are made on the cards in appropriate spaces. Later, the cards are processed by a reproducing gang-punch equipped with a mark-sensing feature which senses electrically the pencil marks on the cards and punches the data into them. The cards are then ready for compilation or tabulation in the usual manner.[4]

A possible third procedure is to key-punch the data directly into the tabulating cards on location when the observations and measurements are made. A portable, manually operated key-punch machine is used, with a two-man field crew consisting of cruiser and "tallyman" or key-punch operator.

The portable key-punch is mounted on a plywood base. Wide elastic loops are also attached to it for holding the cards. A shoulder strap is added for carrying purposes (Fig. 1). As the cruiser calls out the information for each item, the tallyman punches the data into the cards.

Advantages and disadvantages of field key-punching can be compared with those of the two other procedures usually used. In the listing of data on a regular form or tally sheet for subsequent office key-punching, all information for one tree is usually placed on one horizontal line. A minimum of searching for the proper location for insertion of data is necessary. In mark-sensing cards in the field, however, the proper space on the card must be located exactly both vertically and horizontally. Then, precise control of the pencil must be maintained so that the marks which are made fill the proper spaces but do not overrun them.

In the field use of the portable key punch, very limited control of operations is required for the accurate insertion of data into the card. The card is placed in the machine and the carriage pushed back against the stop so that punch-

[1] Journal Article No. 1990 of the Michigan Agricultural Experiment Station.

[2] Stott, C. B., et. al. Forest control by continuous inventory. U. S. Forest Service, Region, 9. No date.

[3] Wheeler, P. R. The punched card method in colleges and universities: applications in agricultural research: forestry. Columbia Univ. Press. Pp. 369-376. 1935.

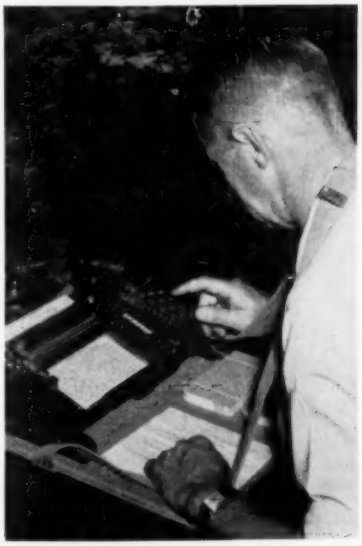


FIG. 1.—The portable, manually operated key-punch in field use.

[4] Wright, J. P. Continuous forest inventory using business machine methods. Proc. Soc. Amer. Foresters Meeting, pp. 182-185. 1954.

ing will begin in the desired column. Sight identification and manual depression of the proper key on the keyboard is all that is required for complete recording of an item of data. The action of the machine is comparable to that of a typewriter, so that less control is required than in the use of the mark-sensing procedure.

The field key-punched card is verified by sight-checking for a punch in the last required column, which insures that there have been no double punches, and no omission of punches. This is a simpler procedure than verifying a mark-sensed card, in which a sight-check is made for marks in the proper number of columns, omitted columns, and double marks in the same column.

Field key-punching is at least as accurate as mark-sensing, since the key-punch advances the card from one column to the next only when a punch is made, thus avoiding missed or double-punched columns which are sources of error in field mark-sensing.

Errors in both field key-punched and mark-sensed cards not detected by verification in the field, are located during the machine processing of the cards. Any omission of columns or double entries in one column will stop machine operations, and the errors can be corrected at that time.

An important advantage of field key-punching over mark-sensing is the greater number of items which can be recorded in the field key-punched card. In mark-sensing, 27 items can be recorded on one side of the card. The cards can be printed and used for mark-sensing on both sides, which makes a maximum of 54 spaces available. Additional items would require two cards for the same tree. In field key-punching, the full 80 columns on the card are available for recording data. If perhaps half of the columns on the card are used in the initial inventory, the same card can be field key-punched at one or more subsequent inventories with remeasurement data for the same tree. Thus, data from several remeasurements can easily be combined on one card. In the mark-sensing procedure, a new card may have to be used for recording remeasurement data, and then the data transferred and punched by machine into the original card.

In a small-scale comparison the authors found field key-punching to be somewhat faster than mark-sensing tree measurement data. Where data are normally tallied or listed in the field for later key-punching in the office, the elimination of the office key-punching operation by field key-punching may reduce the time and cost of electric tabulating methods by 50 percent.

There are some limitations to the field key-punching technique. The portable key-punch weighs 15 pounds, and frequent moving by the "tallyman" from one location or plot to another may become tiring, depending on terrain and understory conditions. This factor may restrict the feasibility of the method to situations where considerable quantities of data are obtained at one location. Some modifications in facilities for carrying the machine in the field may reduce difficulty from that standpoint. Perhaps tripod mounting arrangement would simplify the positioning of the machine for field operation.

In rainy weather, it would be difficult to use either the field key-punching or mark-sensing technique in the field without damage to the cards. In cold weather, it is likely that field key-punching would be the easier of the two to use, since it would be simpler for the tallyman to find and press a key than to make an accurate mark on the mark-sensing card.

The amount of instruction required by the tallyman to operate the portable key-punch properly is no greater than that required for learning proper mark-sensing procedure.

VICTOR J. RUDOLPH
and B. C. SHERRILL
Michigan State University, East Lansing, and Ukiah, California

Ratios for Determining the Economic Road and Landing or Skidway Spacing

The location of logging roads and landings, decks, or skidways should be done with an understanding of the relationships involved. Skidding, road, and landing or skidway costs are interdependent. Only by a careful balancing of these elements can minimum costs be obtained. Professor Matthews[1] shows how to determine costs in Tables 4 and 6 of his text book which can be used to help plan the layout of roads and landings or skidways. These require the solution of many formulae and are time consuming.

A study of the formulae shows that for any given set of conditions the values substituted are constant. Also, these tables always require use of the same set of formulae first. Therefore, their use becomes simpler if the other formulae in the tables can be expressed in terms of the formulae first used.

The formulae given in Matthew's Table 4 were first adjusted according to Suddarth's[2] work. Then, ratios were calculated which expressed the relationship of each of the other formulae to those "first used." The ratios were first found for the road spacing formulae. These ratios were then substituted into all other corresponding formulae where the symbol S occurred. Only the numerical part of the formulae was used to derive the ratios. The results are shown in Table 1.

To use this table of ratios for the two-way skidding, i.e., landings are in center of rectangles:

1. First use the formulae given for the value $Z = 12.5$ at the top of the table. Calculate the road spacing and then skidding, road, and landing costs.

2. Find the ratio of decrease in landing costs to increase in skidding and road costs by dividing

[1]Matthews, D. M. Cost control in logging. McGraw-Hill Co., New York. 1942.

[2]Suddarth, S. K. Ph.D. thesis. Purdue University, Lafayette, Ind. 1952.

TABLE 1.—RATIOS EXPRESSING ROAD SPACING AND SKIDDING, ROAD, AND LANDING COSTS IN TERMS OF THOSE WHEN $Z^1 = 12.5$

(1)	(2)	(3) Per unit volume	(4)	(5)	(6)	(7)
Level (2-way skidding) Z	Skidding cost	Road cost	Landing cost	Spacing of roads S	Ratio of decrease in landing cost to increase in skidding & road costs	Slopes (one-way skidding) Z
		$\frac{4.356r}{VS}$	$\frac{L}{.028696S^2V}$	$\sqrt{\frac{11.1159r}{VC}}$	(*New ratios*)	
12.5	$.2545CS$					
20	1.0119		.63996	.9886	41 to 1	40
30	1.0311	Same	.4428	.9698	14 to 1	60
40	1.0537	as	.3463	.9490	5.8 to 1	80
50	1.0794	for	.2907	.9265	2.9 to 1	100
60	1.1063	skidding	.2545	.9039	1.8 to 1	120
70	1.1352		.2297	.8808	1.2 to 1	140
80	1.1653		.2129	.8581	0.75 to 1	160
90	1.1953		.1990	.8366	0.67 to 1	180
100	1.2267		.1886	.8152	0.40 to 1	200
150	1.4185		.1678	.705	0.14 to 1	300
200	1.6892		.1788	.582	0.05 to 1	400
		$\frac{4.356r}{VS}$	$\frac{L}{.057392S^2V}$	$\sqrt{\frac{8.5579r}{VC}}$		25
	$.5090CS$					

^1Z—Landing spacing as a percent of road spacing.
C—Cost of skidding per 100 ft. per unit volume.
S—Road spacing in hundreds of feet (stations).
r—Road cost, construction and maintenance, per 100 ft.
V—Volume per acre.
L—Landing or deck or skidway cost (average cost per unit built).

the total of road and skidding costs by the landing costs. Then look in column (*6*) for the nearest ratio and read the corresponding Z value. This indicates the relationship of road and landing spacing that will approximate minimum costs; i.e., if nearest ratio, column (*6*), is 1.8 to 1, then $Z = 60$ will give this relationship.

3. Multiply the road spacing figure and the road, skidding, and landing costs when $Z = 12.5$ by ratios given in the table for the new value of Z; i.e., for $Z = 60$ would use $S \times .9039$, skidding cost $\times$ 1.1063, etc.

4. If costs and road spacing are derived for some Z value as 60 and it is necessary to find costs and spacing for another Z value as 40, a quotient can be found from the ratios which can be used as a multiplier:

Road spacing ratio

$Z = 60$ .9039 Column (5)
$Z = 40$ .9490 Column (5)

Divide: $\frac{.9490}{.9039}$ = quotient.

(Divide the ratio for the desired new spacing by the ratio for the known spacing.)

The road spacing as found for $Z = 60$ multiplied by this quotient gives the road spacing for $Z = 40$. Costs can be computed similarly.

Similar relationships exist for Table 6 (in Matthew's text) showing road spacing and road, skidding, and landing cost derivations for one-way skidding on slopes. Table 1 also can be used to substitute for Matthew's Table 6. All values were doubled to derive the figures for his Table 6. Thus the ratios do not change. Merely by doubling the Z values the corresponding ratios can be used without change.

To use Table 1 in place of Table 6 (Matthews) first use the formulae at the bottom of Table 1 for $Z = 25$ and the right hand column of Z values. Calculate the road spacing first and then skidding, road, and landing costs. Proceed then, as previously explained, determining the ratio of decrease in landing costs to increase in the cost of roads and landings. Find the nearest ratio in column (*6*) and then use the corresponding ratios, columns 2-5, to recalculate minimum costs and the necessary road spacing. The figures given in Table 1 may be graphed and ratios may then be read for any relationship of landing spacing to road spacing if so desired.

Finally, a previous study[3] showed that these tables of Matthews can be used only on "hot" logging operations. Variations in landing spacing and/or road spacing change the volume of wood tributary to a landing or skidway. Such variations mean a larger or smaller landing or skidway must be built, and the costs vary. Matthew's procedure is based upon unchanging landing costs regardless of wood volume passing over them.

OLIVER P. WALLACE
University of New Hampshire, Durham

[3]Wallace, O. P. Ph.D. thesis. University of Michigan, Ann Arbor, Michigan. 1953.

We Present

Ralph Sheldon Hosmer

Our country is admired throughout the world for "American know how." It is our most exportable commodity. Newly formed governments are particularly desirous of learning the means by which industry and agriculture in America combine human ingenuity, modern science, organizing skill, and the creative efforts of workmen, to produce an abundance of food and other commodities with a limited expenditure of human effort. Even Russians study it.

We like to picture the typical American expert as one who quickly sizes up the key factors in an unfamiliar social and economic situation. He plans a program and with the aid of a few American dollars, sets about putting it into effect, while skeptical natives look on in disbelief. But the undaunted American expert selects young men from among his workers, trains them in his methods, and gradually turns over responsibility to them. Within a relatively short time, the new system is operating efficiently under full local control, and our expert returns home to receive the plaudits of his fellow countrymen.

We think of this "expertizing" as a post World War II activity of our government, and it is. Yet, perhaps significant achievements were made decades ago. It is particularly amazing that such achievements were made in forestry when forestry in our own nation was in its infancy. Yet, this is exactly what one American forester, but two years out of forestry school, achieved in ten short years. He even went much further than many current experts in that he established a government policy and a system of forestry that has carried forward without interruption to this date.

In 1903 Hawaii set up a division of forestry with provisions authorizing forest reserves and calling for the employment of a professional forester. Ralph Sheldon Hosmer was appointed to this position and reached Hawaii in January 1904. Reporting on his first year on the job, he sized up the major forestry situation for each district in the islands. He recognized that the most important resource of Hawaiian forests was water for irrigation of agricultural lands; also, that the two greatest hazards to maintaining adequate forest cover on the watersheds were grazing and fire. As the well-being of the people of the island was inextricably bound up with the water supply, he realized that protecting these watersheds must be made a matter of public responsibility.

Ralph Sheldon Hosmer

He, therefore, proposed a system of forest reserves embracing approximately one-fourth of the total area of the islands. He advocated extending the forest area by planting and began large scale test planting of exotic trees to determine those best suited for such extension. The first reserves were set aside in 1904. Ten years later, the total area exceeded 798,000 acres in 37 reserves. Subsequent acquisitions have raised the total to over 1,200,000 acres or one-fourth the total area of all the islands.

The establishment and organized management of the reserves was his most important function as forester. These had to be protected against trespass, fenced, and the wild cattle and goats brought under control. A fire control organization for all forest and brush lands was established and an educational program to gain general support for conservation from the public was undertaken. Hosmer trained local men to carry on the necessary protective functions and influenced others to gain professional training and take over the management of forestry when he left.

Hosmer's contribution to forestry in Hawaii has been recognized by setting aside the Ralph S. Hosmer grove of timber on the slopes of Mt. Haleakala in the Hawaiian National Park where he is memorialized as being the father of Hawaiian forestry. Hosmer's contribution to Hawaii, however, included more than the mere establishment of an effective forestry program. He attended the White House Conference of Governors that met in 1908 to plan for better conservation of Hawaii. Upon his return, he was made chairman of the Conservation Commission of Hawaii. He was appointed chairman of a group of delegates to represent the territory at the 17th National Irrigation Congress in Spokane, where he delivered a paper on what reclamation means to Hawaii. He served on the Board of Trustees of the College (now University) of Hawaii from 1907 to 1914.

By 1914, Hosmer had made a contribution to forestry of such significance as to bring him lasting fame, but he was to go on to even greater service in the following years. But first a word about his background.

Ralph Hosmer was born March 4, 1874, in Deerfield, Massachusetts. The families of both his parents had come to Massachusetts as early as the mid-sixteen hundreds and had established themselves as people of influence in the colony. Ralph entered Boston Latin School where, after two years, he had a serious bout with pneumonia and was advised by his physician to spend two years working out of doors to regain his health. One of his activities during this period was cutting trees. He became acquainted with the Bussey Institute because of its nearness to his home and this led him to the study of natural science at the Lawrence Scientific School and at the Bussey. He obtained his degree from Harvard in 1894, spent an additional year working at Harvard and with the city

engineer in Boston, then entered the U. S. Department of Agriculture as a soil scientist.

It was while working in soils in the Department that he met Gifford Pinchot and in 1898 became the seventh man to be employed in forestry under G. P. His early assignments took him to the Adirondacks and the White Mountains, where he engaged in various studies. He took off a year to return to school and was graduated in the first class of foresters to receive the Master of Forestry degree from the Yale School of Forestry. Returning to Washington in 1903, he was given broad responsibilities, but a year later left for Hawaii.

Hosmer returned from Hawaii in 1914, to become professor and head of the Department of Forestry at Cornell University. His role there was not an easy one. The first forestry school to be established in the United States of full collegiate rank was the New York State College of Forestry at Cornell University, which began operation in 1898. Its dean was Dr. Bernhard E. Fernow. Appropriations for this college were withdrawn in 1903, primarily because certain recreationists disapproved of Fernow's plan for converting hardwoods lands to conifers on properties in the Adirondacks acquired for the college. All instruction in forestry was suspended in 1903.

It was resumed in 1910, as a Department of Forestry in the New York State College of Agriculture at Cornell University. The following year the New York State College of Forestry at Syracuse University was established by the legislature. Between the two schools, one at Syracuse and the other at Cornell, there developed a spirit of intense rivalry that was to last for 25 years and absorb a considerable amount of the thought and energies of men at the head of both forestry schools. It unquestionably led to many frustrations and limitations on what each could achieve. Suffice it to say that Hosmer built at Cornell a strong and respected faculty, and graduated over 375 foresters who have made outstanding marks in the profession. Their record is the strongest possible testimony to the soundness of Hosmer's educational statesmanship and the quality of instruction that he organized at Cornell.

His students remember him for his alert and wide-ranging mind, for his wide interests going far beyond the field of forestry, and most of all for his kindly and gentlemanly qualities. Moreover, he had a deep interest in students and sought to help each one to develop those qualities that would make him successful in his chosen profession. Never one to preach, or to find direct fault with another, he taught by precept and example and he always showed respect for the other man and his point of view.

Despite the pressures to keep forestry alive at Cornell, Hosmer found time for a host of outside activities. In 1921, he spent six months abroad travelling. He studied forestry in Great Britain, Scandinavia, France, and Switzerland. His penetrating analysis of the work in these countries has been collected together in the bulletin entitled, "Impressions of European Forestry."

In 1923, he was elected president of the Society of American Foresters. Here, he was again brought into the midst of a sharp struggle, this time between two factions in the Society. One, under the leadership of Gifford Pinchot, favored the passage of legislation to regulate timber cutting on private lands. The other thought such a drastic step was untimely and advocated a more moderate program. Hosmer had been closely associated with Pinchot from 1898 to 1904 and even while serving in Hawaii, the two exchanged views frequently. It was not easy for Hosmer to break away from the leadership of Pinchot and follow his own independent line of thinking. He did so, yet still managed to avoid the development of a serious schism among the members of the Society.

Meanwhile, a small group, called "The National Forestry Program Committee," working quietly behind the scenes, set about preparing a non-controversial legislative program and working for its enactment. The general Forest Land Exchange Act, the Clarke-McNary Act, and the McSweeney-McNary Act resulted from their activities. Hosmer became their historian and in 1947 published a record of their activities.

The policy of this committee seems consistent with Ralph Hosmer's attitude and actions. His role has been that of a conciliator, seeking to compose minor squabbles and to achieve major goals. When basic issues were at stake, however, Hosmer could always be counted on the side of forest conservation.

His trip abroad and his presidency of the Society during the period of particularly acute ferment among members impelled him to delve deeply into forest history and policy and to look to other lands for help on these questions. It is not surprising that during his later years at Cornell and especially during his period of retirement, Hosmer is noted for his contributions in international forestry and in forest history and policy. Meticulous in detail, Hosmer has made a splendid historian. His sketches of Hough, Fernow, Pettis, Whipple, and others active in New York forestry, his writings on the history of education in forestry, including the bulletin, "Forestry at Cornell," have been especially valuable.

Though the author of some 70 articles and bulletins, Hosmer's contribution to forestry is by no means limited to his own writings. Always ready to help others, both by direct encouragement, and by writing chapters or outlines of chapters, he has helped add substantially to the significant forestry literature of our country.

Being a man of great humility and retiring in nature, one is amazed at the many things Hosmer accomplished and how well he did them. It was natural that honors come his way. Some of the most significant are: Fellow of the Society of American Foresters and recipient of the Schlich Memorial Award in 1950, Charter Member of the Society of American Foresters and of the U. S. Forest Service, honorary member of the Societas Forestalis Fenniae and especially honored by the naming of the Ralph S. Hosmer Grove in the Hawaiian National Park.

He typifies the best among American foresters. Hosmer has always been generous to the extreme in serving the Society of American Foresters, and in helping younger foresters who studied under him or who came to him for advice. Now, at 83, he is still the consumate gentleman he has always been, still actively serving his profession, the Society of American Foresters, and Cornell University. He is ever willing to undertake a special study, involving delving into history or checking on a new development in current forestry policy. Our profession has indeed been fortunate that a man who had lived through so much of forestry retains at his advanced years the physical and mental vigor necessary to continue setting before all of us factual records of the achievements of the past. We all wish him many additional years as historian and elder statesman of our profession.

Hardy L. Shirley

Reviews

The Future of Arid Lands

Edited by Gilbert F. White. 453 pp. Illus. American Association for the Advancement of Science, Washington, D. C. 1956. $6.75.

For the scientist or technician concerned with arid land problems in any way, reading this book will be a rewarding experience. It provides a scholarly review of some of the available information on plant, soil, and animal sciences pertaining to arid lands, together with recent research and progress. Equally important, it gives an insight of the relationships of the many facets of scientific knowledge and indicates where serious gaps in information exist.

In April 1955, scientists concerned with the world's arid lands met in Albuquerque and Secora, New Mexico to discuss urgent problems and the present status of research and development associated with arid lands. This book contains their presentations and a number of conference recommendations.

The reports presented are grouped under five headings: (1) the broad review of the problem; (2) variability and predictability of water supply; (3) better use of present resources; (4) prospects for additional water sources; (5) better adaptation of plants and animals to arid conditions.

In bringing together the papers of this symposium Dr. White made no attempt to reconcile differences of view or to fill obvious gaps in information. Troublesome questions are identified by the separate authors and new avenues of attack plotted. The individual papers and group recommendations may be considered guide posts to scientific development in at least three ways. First, they present a promising method of collaboration across both national and disciplinary boundaries. Second, they point out specific areas of research in which more vigorous activity is needed. Third, they present suggested methods of thinking about the future of arid lands that may play a significant role in shaping the concept of selecting, improving, and breeding plants and animals for arid conditions rather than adjusting the environment of plants and animals imported from humid areas.

H. L. Shantz, who opened the conference, aptly points out that nature has produced a magnificently controlled area occupying about one-third of the land surface. Here is an experiment already planned and carried out. All that is necessary to advance our knowledge in the field of more complete utilization of arid lands is to study and interpret properly what Nature has already accomplished. Can the geneticist breed an animal that can live on medibolic water or can concentrate the urea in the urin or can he produce a maize plant with only one seed root and with one elongated hypocotyl? These are only some of the possibilities where nature has pointed the way for future development.

The whole concept of the water budget provides a framework of thought where much detailed analysis in climatology, hydrology, ecology, and geography are discussed and given new importance. The development of arid lands has been substantial during the past twenty years, but this progress has been mainly within individual disciplines. It is not balanced. Some fields have progressed more than others. Great opportunities for science to serve the development of arid lands lie in more emphasis on basic research.

Perhaps we need more team research; at least, the feeling is gained that special emphasis should be given joint research by both natural scientists and social scientists, working on the same team. In many instances advantages were recognized in joining archeological and hydrological studies or linking botanical and climatological and geomorphic studies in order to cooperatively approach a common problem.

In many of the papers, the scientists repeatedly emphasize the importance of translating scientific findings into action at a level where operating farmers, herders, and land owners, communities and the common laymen can interpret the problem in language they readily understand. Much of the deterioration of arid lands has been due to such conditions as 10-year property rights, political control, social aptitudes, and taxes which impede application of new knowledge and techniques. Much of the driving force necessary for getting available knowledge applied for improvement of land and water utilization is lacking. This driving force is essentially public demand or social pressure. Creating such a demand is the most effective method of obtaining intelligent use of arid lands.

As Dr. White points out in his introductory statements, the recommendations of the symposium and the conference are guides for information and future scientific investigations. This book will provide a reference material for those desiring a broader look at overall arid land problems. It deserves wide distribution and is well worth the study of those interested in this problem.

H. C. Fletcher
U. S. Dept. of Agriculture, Boise, Idaho

Federal Timber Sales Policies

Joint Report submitted to the Senate Committee on Interior and Insular Affairs by its Subcommittee on the Legislative Oversight Function and House Committee on Government Operations. Part I 27 pp. Part II 577 pp. Hearings 2,229 pp. Government Printing Office, Washington, D. C. 1956.

Foresters who administrate public lands and those who deal with federal forest agencies will find this report packed with highly significant findings affecting public land policies. Dealing as it does primarily with timber sales and land management programs, its recommendations, if adopted, will have an important impact for the years ahead on forestry in the West, focus of the Committee's efforts.

In this era of verbosity, it is a distinct pleasure to read this plain-talking pamphlet (Part I) which develops its case simply and makes recommendations to the point. Right at the beginning the magnitude and significance of federal forest lands are presented in terms of their importance to the economy of the Pacific Northwest. For example, "Federal policies which limit or diminish the availability of timber to the non-timber segments of the industry would have a real impact on the economy of the West."

And again, Colonel William B. Greeley, while he was with the Forest Service, is quoted to illustrate a point:

> The opportunity to purchase national forest stumpage makes it possible for small and independent operators to remain in the industry and compete with the large private owners of timber. . .
>
> As far as practicable we dispose of timber in small lots, suited to small operations, and the great majority of our sales are in small amounts of from 100,000 to 5 million feet. . .

The Report consists of three parts: (1) the Committee's findings, conclusions, and recommendations; (2) a staff analysis of testimony and pertinent background material; and (3) the hearings themselves. Thirteen topics were selected by the Committee upon which to concentrate its analysis. From these a series of recommendations was developed. The topics are: Consolidation, Access, Access Roads, Personnel, Budgeting, Special Indian Land Problems, Timber Sales Restrictions, Land and Timber Exchange, Timber Inventory, Salvage, Measurement and Appraisal, Bidding Methods and Relations with the Public.

The Committee's recommendations flow directly from the evidence developed during the course of its hearings and from staff research; and as a result represent the constructive type of Congressional "watchdog" activity which seldom makes headlines. Examination of two major and one minor federal land management agencies (Forest Service and Bureau of Land Management and Bureau of Indian Affairs) presented an opportunity to compare procedures and methods against what the Committee considered to be desirable public land policy objectives. Although there are far too many recommendations to present here, a few selected will be of major interest to foresters:

1. Consolidation of BLM and Indian Bureau lands under Forest Service Administration by the President within his present reorganization authority.

2. Development of an adequate federal access road system in federal lands and reciprocal right-of-way agreements with all private owners.

3. Review of the desirability of continuation of the 1944 act which permits federal units and cooperative agreements to be set up.

4. The Secretary of Interior should begin at once to develop a sustained yield program for the Klamath Indian Reservation now threatened with dismemberment.

5. Timber sales should be made in medium and small lots of not more than three years' duration and under conditions of maximum competitive bidding.

6. Obsolete tree and log volume tables currently being used by federal agencies should be brought up to date and timber appraisal should be closer to fair market value.

7. Land exchanges should be confined entirely to elimination of lands no longer needed for public purposes.

8. Advisory boards should be confined to solely advisory functions—not policy making functions for which they are neither responsible nor accountable.

9. Of special interest to foresters is the recommendation for a joint salary study by agencies and the Civil Service Commission to insure that federal foresters' salaries are equal to those in private industry and fully reflect the responsibilities which federal foresters have.

These and all of the other recommendations are a large order for executive agencies to digest. Since most of the findings are advisory, not mandatory, they have only Congressional pressure to back them up. Future actions by the bureaus involved will be watched with interest both by foresters as they directly affect our professional activities and by students of federal policy. The report is recommended for study by all foresters interested in the subject it considers. Although forest practices were not scrutinized by the Committee, study of this aspect might deserve future consideration.

CHARLES H. STODDARD
Washington, D. C.

Plant Propagation

By John P. Mahlstede and Ernest S. Haber. 413 pp. Illus. John Wiley & Sons, New York. 1957. $7.50.

This book is written for the beginner in the field of plant propagation as well as for the experienced seedsman and nurseryman. Its main objectives, in the words of the authors, are (1) "to furnish . . . the fundamental principles that control success and failure in plant propagation; (2) to interpret and develop . . . the underlying concepts of plant propagation and the details of practice; (3) to arrange and discuss the subject matter so that it har-

monizes with recent developments in plant propagation, physiology, morphology, and anatomy."

To facilitate teaching, the book is divided into five parts. Part I discusses basic concepts, i.e., plant types, general structure, and growth and development. Part II is devoted to the sexual propagation of higher plants. Part III considers the asexual propagation of higher plants, i.e., bulbs and related structures, layering, rooting of cuttings, and grafting. Part IV discusses briefly propagation structures such as greenhouses, coldframes, hotbeds, and a number of specialized structures; and Part V describes in some detail the methods used in the propagation of specific plants, i.e., fruit trees, ornamentals, perennials, ferns, and mushrooms.

Generally speaking, the authors have succeeded admirably in presenting a well rounded picture. The book enables the reader to evaluate the different methods of propagation and determine which one will be most promising to use in particular instances. The language is simple without being condescending; only occasionally is a technical term used without explanation or with the explanation appearing a page or two further on in the text. Illustrations are numerous and of good quality.

The discussions of vegetative propagation form the best parts of the book. Cuttage is handled with clarity. The descriptions of the use of mist should be helpful to many, and it is refreshing to see the use of hormones discussed without a touch of the supernatural. Hormones are not a cure-all which will make up for improper handling and allow roots to form on species that are extremely difficult to root otherwise. The authors do not hesitate to say so. The simpler, more generally used grafting methods are clearly described and well illustrated. Some readers, however, may wonder exactly how the shield of T-bud graft is performed. The fanciful methods, such as the strap graft, the double-tongue graft, the gap graft, and the strapped-wedge graft have been left out and for good reason—their advantages are highly questionable and they are much too time-consuming for general use. One omission, however, southern forest tree breeders will find hard to forgive: the succulent grafting of pines.

The weakest point in the book is the bibliography. The authors have chosen to list a number of "selected references" at the end of each chapter. For general study these references may be quite valuable, but anyone seeking information on a particular species will find it almost impossible to go beyond what is discussed in the text. Future editions of the book could be materially improved, in this reviewer's opinion, if the text, and particularly the tables in the Appendix, were thoroughly referenced.

The chapter on dormancy and germination of seed is not entirely clear, and the discussion of greenhouse structures could be expanded

As the book is concerned primarily with the propagation of fruit trees and ornamental plants, foresters and forest-tree nurserymen will find little detailed information applicable in their work. They may, however, still find the book worthwhile reading as general background information. Tree breeders, in particular, should be interested in some of the methods used in other fields, as for example the use of the male sterile factor in onion seed production, the discussion of incompatibility between scion and rootstock, and the use and the effects of Malling dwarfing rootstock in apple grafting. They may also find some valuable information on the rooting of cuttings and on grafting.

HANS NIENSTAEDT
Lake States Forest Experiment Station

Publications of Interest

The Division of Forestry Relations of the Tennessee Valley Authority at Norris, Tennessee has published a report comparing the results of two surveys of small sawmills in the Tennessee Valley. The first survey was completed in 1950; the second in 1955.

With some 4,000 sawmills operating in the Valley, the operators have a great influence on the management of the Valley's forests. The study was initiated to determine the effect of this industry on the resource.

Data were first collected on the kinds of logs sawn, on log procurement, on milling practices and equipment, marketing, and degree of utilization. The findings were then widely distributed to the mills. Later numerous one-day conferences were held in an effort to help the mills do a better job, both as regards manufacture and forest management.

The second survey, which this report treats, was made to determine the results of the five-year program of education. The document is multilithed; 39 pages; free.

* * *

Diseases of North American Forest Trees Planted Abroad by Perley Spaulding is U. S. Department of Agriculture Handbook No. 100, 1956. It is an annotated listing of tree diseases known to attack North American trees in foreign countries, indicating the seriousness of the attack, and including a host list of tree diseases. A list is also given of plantings of North American trees abroad as an aid to further inquiry into their diseases. Available from the Supt. of Documents, Government Printing Office, Washington 25, D. C. Price 45 cents.

* * *

A Comparison of Two Log-Grading Systems is Bulletin 603, University of Illinois, Agricultural Experiment Station, Urbana, Ill., in cooperation with Purdue University Agricultural Experiment Station, 1956. Written by C. S. Walters and A. M. Herrick, the bulletin reports on a study comparing the U. S. Forest Service, Forest Products Laboratory log-grading system with one developed by the Purdue University Department of Forestry and Conservation.

Current Literature

Compiled by MARTHA MEELIG, *Librarian, State University College of Forestry at Syracuse University*
Range Management Section Compiled by Division of Bibliography, Library, U. S. Department of Agriculture

General

Comparative Description of the Native Trees of the Sewanee Area. 45 pp. Dept. of Forestry, Univ. of the South, Sewanee, Tenn. 1957.

A World Geography of Forest Resources. Ed. by Stephen Haden-Guest, J. K. Wright and E. M. Teclaff. 736 pp. Illus. Ronald Press, New York. 1956. $12.50.

Forest Genetics

A Selected Bibliography on Forest Tree Improvement. By E. L. Shafer and H. H. Chisman. 49 pp. School of Forestry, Pennsylvania State Univ. [1957] Mimeog.

Forest Management

Air Photo Overlays. By W. U. Hardy. 9 pp. Canada Dept. of Northern Affairs and National Resources, Ottawa. 1956. For. Research Div. Tech. Note No. 46.

Forest Products

The Charcoal Production and Marketing Situation in the United States with Reference to Minnesota. By R. A. Skok and R. I. Beazley. 42 pp. Univ. of Minnesota, Agric. Expt. Sta. 1956. Paper No. 3567. Mimeog.

Maple Sirup and Other Maple Products. By F. E. Winch, Jr. and R. R. Morrow. 43 pp. Illus. New York State College of Agriculture, Ithaca. 1957. Cornell Ext. Bul. 974.

Forest Resources

Forest Inventory Statistics for Henry County, Tennessee. 18 pp. TVA, Norris. 1957. Forestry Bul. No. 47. Mimeog.

Forest Resources of Bayfield County. 22 pp. Wisconsin Conservation Dept., Madison 1. 1956. Publ. No. 20.

Forest Resources of Douglas County. 22 pp. Wisconsin Conservation Dept., Madison 1. 1956. Publ. No. 19.

The Timber Supply Situation in Georgia. By R. W. Larson. 51 pp. Illus. U. S. Dept. of Agric., Washington 25, D. C. 1956. For. Resource Rept. No. 12. 55 cents (Govt. Print. Off.)

Logging and Milling

Adjustable Sawmilling Gauge. By G. W. Andrews. 4 pp. Illus. Forest Products Laboratories of Canada, Ottawa. 1957.

Initial Study of Kiln Drying Clear Douglas Fir Planks. By H. D. Stillwell. 9 pp. Illus. Oregon Forest Products Lab., Corvallis. 1957. Rept. No. D-4.

Protection

The Forest Insect and Disease Situation Lake States, 1956. By C. L. Beckwith and R. L. Anderson. 26 pp. Illus. Lake States Forest Expt. Sta., St. Paul, Minn. 1956. Station Paper No. 42. Mimeog.

The Pine Shoot Moth and Related Species. 7 pp. Illus. Great Britain Forestry Commission, London. 1956. Leaflet No. 40. 9d. (H. M. Sta. Off.)

Spruce Budworm Control in Oregon and Washington 1949-1956. By J. M. Whiteside. 23 pp. Illus. Pacific Northwest Forest & Range Expt. Sta., Portland, Ore. 1956. Mimeog.

Range Management

Comparative Nutritive Value and Palatability of some Introduced and Native Forage Plants for Spring and Summer Grazing. By C. W. Cook, L. A. Stoddart, and L. E. Harris. 39 pp. Utah Agric. Expt. Sta., Logan. Bul. 385. June 1956.

The Future of Arid Lands. Papers and Recommendations from the International Arid Lands Meetings. Edited by G. F. White. 453 pp. Illus. American Association for the Advancement of Science. Publ. 43. Washington, D. C., 1956. $6.75.

Improving Shortgrass Range by Pitting. By F. Rauzi and R. L. Lang. 11 pp. Wyoming Agric. Expt. Sta. Laramie. Bul. 344. August 1956.

Range Pitting and Reseeding Trials on the Texas Range Station near Barnhart, 1950-55. By G. W. Thomas and V. A. Young. 5 pp. Texas Agric. Expt. Sta., College Station. Progress Rept. 1882. July 9, 1956.

Silviculture

British Yield Tables for European and Japanese Larches in New York. By E. L. Stone, Jr. 4 pp. Illus. New York State College of Agriculture, Ithaca. 1957. Agronomy Paper No. 397.

Collecting and Planting Seeds of Cone-Bearing Trees. 4 pp. Illus. Univ. of Wisconsin Ext. Serv., Madison. 1956. Cir. No. 535.

The Ecology of Lodgepole Pine in Alberta and Its Role in Forest Succession. By K. W. Horton. 29 pp. Canada Dept. of Northern Affairs and National Resources, Ottawa. 1956. For. Research Div. Tech. Note No. 45.

Effect of Crown Cover and Slash Density on the Release of Seed from Slash-Borne Lodgepole Pine Cones. By D. I. Crossley. 51 pp. Illus. Canada Dept. of Northern Affairs and National Resources, Ottawa. 1956. For. Research Div. Tech. Note No. 41.

Look to the Hardwoods! By W. E. McQuilkin. 17 pp. Northeastern Forest Expt. Sta., Upper Darby, Pa. 1957. Station Paper No. 91.

Plantation Survival and Growth in Two Brush-Threat Areas in Coastal Oregon. By R. H. Ruth. 14 pp. Illus. Pacific Northwest Forest & Range Expt. Sta., Portland, Ore. 1956. Research Paper No. 17. Mimeog.

Plantations of the Acadia Forest Experiment Station. By J. W. McLeod. 25 pp. Illus. Canada Dept. of Northern Affairs and National Resources, Ottawa. 1956. For. Research Div. Tech. Note No. 31.

The Quality of Poplar Plants. 8 pp. Illus. Great Britain Forestry Commission, London. 1956. Leaflet No. 39. 6d.

Survival of White Spruce Seedlings Resulting from Scarification in a Partially Cut Mixedwood Stand. By J. Ouaite. 9 pp. Illus. Canada Dept. of Northern Affairs and National Resources, Ottawa. 1956. For. Research Div. Tech. Note No. 44.

White Pine Growth and Soil Relationship in Southeastern New Hampshire. By Bertram Husch and W. H. Lyford. 29 pp. Illus. New Hampshire Agric. Expt. Sta., Durham. 1956. Station Tech. Bul. No. 95.

Wildlife

Studies in Wildlife Management 1. Fox Populations and Food Habits in Relation to Game Bird Survival, Willamette Valley, Oregon. By M. S. Wilcomb. 16 pp. Oregon State College Agric. Expt. Sta., Corvallis. 1956. Tech. Bul. No. 38.

Wood Technology and Utilization

Industrial Use of Woodwaste. 68 pp. Organisation for European Economic Co-operation, 2 Rue André-Pascal, Paris-16e. 1956. Project No. 221.

The Sampling of Timber for Standard Mechanical Tests. Part I. . . II. . . By C. R. Hellawell and W. G. Warren. 12 pp. Forest Research Ints. New Zealand Forest Serv., Wellington. 1956. Research Notes No. 7.

Utilisation of Hazel Coppice. 33 pp. Illus. Great Britain Forestry Commission, London. 1956. Bul. No. 27. 10s.

Utilization of Wood Residues for Pulp Chips. By Milton Applefield. 121 pp. Illus. Texas Forest Serv., College Station. 1956. Bul. No. 49. Mimeog.

Society Affairs

Officers and Council
1956-1957

DEWITT NELSON, *President*
Department of Natural Resources
315 State Office Building 1
Sacramento 14, Calif.

GEORGE A. GARRATT, *Vice President*
School of Forestry
Yale University
New Haven 11, Conn.

HENRY CLEPPER, *Executive Secretary*
Mills Building, 17th Street at Pennsylvania Avenue, N.W.
Washington 6, D. C.

B. E. ALLEN
Union Bag-Camp Paper Corporation
P. O. Box 570
Savannah, Ga.

STANLEY G. FONTANNA
School of Natural Resources
University of Michigan
Ann Arbor, Mich.

JOSEPH S. ILLICK
College of Forestry
State University of New York
Syracuse 10, N. Y.

PHILIP A. BRIEGLEB
Southern Forest Experiment Station
704 Lowich Building
2026 St. Charles Avenue
New Orleans 13, La.

MAURICE K. GODDARD
Department of Forests and Waters
Harrisburg, Pa.

J. HERBERT STONE
U. S. Forest Service
729 N.E. Oregon St.
Portland 8, Ore.

C. HUXLEY COULTER
Florida Forest Service
Tallahassee, Fla.

EDWIN F. HEACOX
Weyerhaeuser Timber Company
Tacoma 1, Wash.

HENRY J. VAUX
School of Forestry
University of California
Berkeley 4, Calif.

The President's Column

DEWITT NELSON

In March I had the privilege of participating in the annual meeting of the Columbia River Section at Salem, Oregon. About the time this comes off the press I hope to be with Gulf States Section at New Orleans.

Few men have the good fortune of attending such meetings in the east, west, north, south, and middle states. No matter where they meet, foresters have different problems and programs and yet there is great similarity—a sameness with a difference that provides a stimulating flavor to any such meeting.

Throughout the country spring has come. The winter's "cold deck" of logs has disappeared; the crews are back in the woods; the fire season should be temporarily over in the South while in the West it is just around the corner. Most of the states' legislative sessions are over and the course has been recharted for another year or two. In short, the 1957 season is under way.

How many of us accomplished all that we had planned to do last winter? Will we be able to crowd into the coming field season all that we plan for it? Probably not, but I believe it is better to shoot high on the target than low. It is better to be pushed than held back.

Wherever I go I find foresters to be a practical lot. They dream, plan, and philosophize but usually within the realm of practicality. There are constant pressures for actions, solutions, and results but it takes time to develop conclusive answers from Nature's laboratory.

Here is another season, another field laboratory, another test tube and another opportunity to gain one more step on the ladder of knowledge. May it be a successful and profitable season for every phase of forestry.

De Witt Nelson

Fourth Call for Council Nominations

All members are hereby notified that the regular biennial election will be held December 2, 1957. A president, vice president, and nine other members of the Council will be elected for the two-year term 1958-1959.

The present Council is listed in the box on page 308. Any or all of these incumbents may be renominated, provided they accept the nomination in writing.

President DeWitt Nelson has announced that he will not be a candidate for re-election.

Membership on the Council is restricted by the Constitution to Members (formerly Senior Members) and Fellows. Any Member or Fellow is eligible to hold office who is in good standing and who accepts the nomination in writing and declares his willingness to serve if elected.

Each voter will have an opportunity to ballot on all candidates for office. Council members are elected in accordance with the system of proportional representation. The procedure of proportional representation will be explained in a later issue of the JOURNAL. It is the system by which the Society has been electing Council members for over two decades.

Candidates for the office of president are voted on separately; the candidate who receives the highest vote is declared elected president, and the candidate who receives the next highest vote is declared elected vice president.

How Nominations Are Made

The Constitution (Article VIII, Section 2) states the conditions under which nominations are made by petition.

1. Each petition shall name but one candidate.

2. All candidates must be eligible to hold elective office.

3. A petition shall bear the signatures of at least ten voting members who at the time of signing the petition are eligible to vote in the coming election. (Eligible voting members are Junior Members, Members, and Fellows in good standing.)

4. A voting member may not sign more than one nominating petition for president, nor more than one nominating petition for a member of the Council. That is, he may sign two, but no more.

5. Petitions must be in the Society office by September 18, 1957.

The Society has no special form for submitting nominating petitions. They may be written as follows:

We, the undersigned voting members of the Society of American Foresters, hereby nominate John Doe, a Member (or Fellow) for the office of president (or member of the Council) for the two-year term 1958-1959.

All nominating petitions should be sent promptly to the Society office. The executive secretary will gladly provide information about nominating or election procedure.

According to the Constitution (Article VIII, Section 1) a Nominating Committee has been appointed by President Nelson. The Committee is composed of the following members:

Chairman, J. H. Johnson, Chesapeake Corp. of Virginia, Box 534, West Point, Va.

S. T. Carlson, National Park Service, P. O. Box 1728, Santa Fe, N. Mex.

Albert Engstrom, Oklahoma Division of Forestry, Capitol Building, Oklahoma City, Okla.

James E. Sowder, Deschutes Research Center, U. S. Forest Service, Bend, Ore.

Harry E. Troxell, School of Forestry, Colorado A & M College, Fort Collins, Colo.

This committee is charged with the following duties:

1. To set the date of the election. (December 2, 1957 is the date.)

2. To provide for at least two candidates for the office of president, and at least nine candidates for membership on the Council.

3. To receive separate nominating petitions for the office of president and for each member of the Council, and to supplement such petitions when necessary with other nominations in order to comply with item 2 above.

The Nominating Committee will make no nominations of its own unless the voting membership fails to make the required minimum number of nominations by petition. Voting members should accordingly get busy and make their own nominations. For their information the distribution of Council members by states during the period 1942-1957 is shown on page 388.

Nominations Received

Up to the time of going to press the following nominations had been received:

For President

George A. Garratt, New Haven, Conn. (Vice president, 1956-1957).

Henry J. Malsberger, Atlanta, Ga.

For The Council

B. E. Allen, Savannah, Ga. (Council member, 1956-1957.)

Kenneth P. Davis, Ann Arbor, Mich.

M. B. Dickerman, St. Paul, Minn.

Glen R. Durrell, Stillwater, Okla.

M. K. Goddard, Harrisburg, Pa. (Council member, 1956-1957.)

P. L. Lannan, Georgetown, S. C.

A. D. Nutting, Orono, Maine.

J. H. JOHNSON, *chairman,*
Nominating Committee

Fourth Call for Fellow Nominations

All Members (formerly Senior Members) and Fellows of the Society are hereby advised that nominations for the grade of Fellow are now open. The election of Fellows will be held at the time of the Society's regular biennial election, December 2, 1957.

As defined by the Constitution (Article III, Section 7), "Fellows shall be foresters of outstanding achievement as leaders in responsible directive or distinctive individual work of a fruitful character. They shall be elected from the Members and shall be engaged in forestry work at the time of their election."

Nominations by Petition

The procedure for placing Members in nomination for the grade of Fellow is by petition. The Society has no printed form for this purpose; the petition may be typewritten thus:

We, the undersigned Members and Fellows of the Society of American Foresters, hereby nominate John Doe for election to the grade of Fellow in 1957.

Remember these simple rules:

1. A petition may not name more than one candidate.

2. It must be signed by 25 Members or Fellows in good standing.

3. It should be accompanied by a factual, not eulogistic, biographical sketch of at least 200 words giving an account of the nominee's professional career and accomplishments.

4. It must be received in the execu-

TABLE 1.—DISTRIBUTION OF COUNCIL MEMBERS BY STATES DURING PERIOD 1942-1957
(Presidents' names are in capital letters; vice presidents', in italics)

State	1942-1943	1944-1945	1946-1947	1948-1949	1950-1951	1952-1953	1954-1955	1956-1957
Alabama	Smith, H. A.				Porter, Earl	Porter, Earl		
California	Baker, F. H.	Baker, F. H.		Nelson, DeWitt	Nelson, DeWitt	Thompson, P. A.	*Nelson, DeWitt*	NELSON, DEWITT
	Keen, F. P.	Keen, F. P.						Vaus, H. J.
Colorado	Peck, A. C.			Spencer, J. W.				
Connecticut	Hawley, R. C.	Hawley, R. C.		McArdle, R. E.	McArdle, R. E.	McArdle, R. E.		*Garratt, G. A.*
Dist. of Columbia	Behre, E. C.						Coulter, C. H.	Coulter, C. H.
Florida				*Evans, C. F.*	EVANS, C. F.			Allen, B. E.
Georgia			Evans, C. F.	Evenden, J. C.				
Idaho			Evenden, J. C.					
Illinois			Coffman, J. D.					Briegleb, P. A.
Louisiana	Eldredge, I. F.				Demeritt, D. B.	Demeritt, D. B.	Demeritt, D. B.	
Maine					Fontanna, S. G.		Fontanna, S. G.	Fontanna, S. G.
Michigan	*Allen, S. W.*	*Allen, S. W.*	ALLEN, S. W.		Kaufert, F. H.	Kaufert, F. H.	Westveld, R. H.	
Minnesota	SCHMITZ, H.	SCHMITZ, H.				Westveld, R. H.	Hanson, P. D.	
Missouri					*Herr, C. S.*			
Montana	Gisborne, H.	Smith, G.	Herr, C. S.	Herr, C. S.	Lindh, C. O.	Lindh, C. O.		
New Hampshire								
New Mexico							Illick, J. S.	Illick, J. S.
New York	Howard, W. G.	Recknagel, A. B.	Recknagel, A. B.			*Demmon, E. L.*	DEMMON, E. L.	
North Carolina		Damtoft, W. J.	Damtoft, W. J.				Stone, J. H.	Stone, J. H.
Oregon		Dunn, P. M.	Dunn, P. M.	Dunn, P. M.	Brundage, F. H.			Goddard, M. K.
Pennsylvania								
South Carolina		Shirley, H. L.		Flory, C. H.				
Tennessee				Baker, W. M.				
Washington		Greeley, W. B.	Greeley, W. B.	Greeley, W. B.	Markeworth, G.	DRAKE, G. L.	Heacox, E. F.	Heacox, E. F.
			Martin, C. S.	MARTIN, C. S.		Markeworth, G.		
Wisconsin		Price, J. H.	Price, J. H.			Brown, W. J.	Brown, W. J.	

tive office of the Society in Washington, D. C., not later than September 18, 1957.

The executive employees of the Society cannot be responsible for obtaining signatures on partially completed petitions or on petitions incomplete by reason of unacceptable signatures (that is, signatures of other than Members and Fellows in good standing).

Election Procedure

Fellows are not elected by the membership at large, but by a board of electors which consists of all present Fellows and the present Council. (A Council member who is also a Fellow has but one vote.)

The system is described in Article IV, Section 4 of the Constitution. To win election a candidate must receive an affirmative vote of not less than one-half the total votes cast.

During 1957, the voting membership of the Society will have an opportunity to ballot on a proposal by the Council that would increase the number of Fellow electors. If the referendum is approved, the chairmen of the 21 Sections and the chairmen of the 11 subject Divisions, a total of 32 electors, will cast votes for Fellows in addition to the present Fellows and the Council. For a detailed discussion of this proposal members are referred to the JOURNAL for April 1956, page 279, and for June 1956, page 410.

Significance of the Grade

The highest membership distinction that can be conferred by the Society, this grade is awarded in recognition of outstanding achievement. Fellows do not pay increased dues; their dues are the same as those of Members.

Since the Society was founded in 1900, there have been 109 Fellows elected. At the present time the number of living Fellows is 75.

List of Fellows

The current roster of Fellows follows. The state in which each Fellow is domiciled and the year of his election are shown after his name.

Allen, Shirley W. Michigan. 1948.

Bailey, Reed W. Utah. 1955.
Baker, Frederick S. California, 1949.
Besley, Fred W. Maryland. 1940.
Boyce, John S. Connecticut. 1955.
Brundage, Frederick H. Oregon. 1949.
Butler, Ovid. Maryland. 1940.

Carter, E. E. District of Columbia. 1942
Chapman, Herman H. Connecticut. 1922.
Clapp, Earle H. District of Columbia. 1930.
Clepper, Henry E. Virginia. 1949.
Coffman, John D. California. 1946.
Cox, William T. Minnesota. 1953.
Curran, Hugh. Venezuela. 1951.

Damtoft, Walter J. North Carolina. 1951.
Dana, Samuel T. Michigan. 1935.
Demeritt, Dwight B. Maine. 1955.
Demmon, Elwood L. North Carolina. 1951.
Detwiler, Samuel B. Colorado. 1955.
Drake, George L. Washington. 1953.

Eldredge, Inman F. Lousiana. 1942.
Evans, Charles F. Georgia. 1949.
Evenden, J. C. Idaho. 1953.

Ferguson, J. A. Pennsylvania. 1949.
Fischer, Arthur F. California. 1940.
Fontanna, Stanley G. Michigan. 1955.
Fritz, Emanuel. California. 1951.
Frothingham, E. H. California. 1942.

Garratt, George A. Connecticut. 1953.
Gill, Tom. District of Columbia. 1948.
Granger, Christopher M. Maryland. 1946.
Guise, Cedric H. New York. 1951.
Guthrie, John D. Virginia. 1942.

Hall, J. Alfred. Wisconsin. 1955.
Hall, William L. Arkansas. 1940.
Hartley, Carl P. Maryland. 1949.
Hawes, Austin F. Connecticut. 1939.
Hawley, Ralph C. Connecticut. 1942.
Heintzleman, B. Frank. Alaska. 1951.
Holmes, J. S. North Carolina. 1939.
Hosmer, Ralph S. New York. 1932.
Hunt, George M. Wisconsin. 1951.

Illick, Joseph S. New York. 1946.
Isaac, Leo A. Oregon. 1953.

Jeffers, Dwight S. Oregon. 1948.

Kaufert, Frank H. Minnesota. 1955.
Keen, Frederick P. California. 1955.
Kelley, E. W. California. 1949.
Kellogg, Royal S. Florida. 1949.
Kinney, Jay P. New York. 1942.
Kittredge, Joseph. California. 1953.
Korstian, Clarence F. North Carolina. 1942.
Krueger, Myron E. California. 1951.

Lowdermilk, Walter C. California. 1948.

MacDonald, G. B. Iowa. 1944.
Marckworth, Gordon D. Washington. 1955.
Marsh, Raymond E. District of Columbia. 1948.
Martin, Clyde S. Washington. 1948.
Mason, David T. Oregon. 1948.
McArdle, Richard E. District of Columbia. 1953.
Metcalf, Woodbridge. California. 1953.
Morrell, Fred W. Virginia. 1951.
Munger, Thornton T. Oregon. 1946.
Munns, Edward N. California. 1949.

Preston, John F. District of Columbia. 1948.
Price, Jay H. Arizona. 1951.

Schmitz, Henry. Washington. 1940.
Shirley, Hardy L. New York. 1951.
Show, S. B. California. 1948.
Siecke, E. O. Texas. 1946.
Sparhawk, William N. New Hampshire. 1946.

Watts, Lyle F. Oregon. 1946.
Winslow, C. P. Washington. 1942.
Wirt, George H. Pennsylvania. 1948.

Ziegler, E. A. Pennsylvania. 1949.

National Science Register of Scientific and Technical Personnel

During April members of the Society of American Foresters were sent questionnaires prepared by the National Science Foundation, and mailed by the American Institute of Biological Sciences.

The purpose of the questionnaire is to keep up to date the national register of scientific and technical personnel. This register has been in operation since 1953. Initially it was developed for use if and when needed in national defense. All information supplied by each registrant is punched on an IBM card.

The questionnaire sent all SAF members has been compiled to correct deficiencies in the earlier one mailed in 1954. All foresters, whether registered or not, are urged to complete and return the new questionnaire promptly.

HENRY CLEPPER
Executive Secretary

Call for Papers for the Division of Silviculture

The annual meeting of the Division of Silviculture will be held November 12, 1957 at Syracuse, N. Y. It will consist of a morning and afternoon session. More than one-half of the program has been reserved for volunteer papers.

All members of the Society who wish to present papers before the Division should send complete titles and estimated length of the proposed papers (and preferably a short abstract), together with the name and address of the speaker and the organization he represents, on or before May 15, 1957 to the chairman, Henry I. Baldwin, Hillsboro, N. H.

Members who submit titles for inclusion in the program are reminded that the subject chosen should be one that belongs properly in the Division of Silviculture.

The program will be made up by the executive committee of the Division by selection of papers from among the titles submitted, without regard to order of receipt. In order to provide opportunity for as many as possible to participate in the meeting, preference will be given to papers that can be presented in 10 minutes or less. No paper that requires more than 20 minutes can be considered. Authors of papers selected for the meeting will be notified of that fact as soon as possible, but in any case by June 15, 1957. This is the only call for papers that will be issued by the Division of Silviculture.

E. H. TRYON
Secretary

New England Section Holds Winter Meeting

Approximately two hundred members and guests attended the annual winter meeting of the New England Section, held in the Somerset Hotel, Boston, March 7 and 8.

Chairman Gerald S. Wheeler presided at the opening business session. There then followed topic papers and discussions of state registration of foresters, the Northeastern Forest Fire Protection Commission, methods of forest inventories, pilot woodland management, tree improvement activities, and helicopter application of chemicals to release softwood growth.

At the banquet L. F. Whittemore served as toastmaster. The speakers were Henry Clepper, executive secretary, and E. C. Hirst of Concord, N. H., former Section chairman.

The concluding session was devoted to a discussion of forestry aspects of the soil bank program, and to new business.

SEEN HERE IS the group that met March 11 in the walnut lounge of the new Hugh P. Baker Laboratory at Syracuse to make plans for the SAF annual meeting in the Syracuse Hotel, November 10-13, 1957. Seated L. to R.: Svend O. Heiberg, chairman, Arrangements Committee; Henry Clepper, executive secretary; Mrs. C. Eugene Farnsworth, Ladies Hospitality and Program Committee; Hardy L. Shirley, general chairman; John R. Meyering, assistant to general chairman; Kenneth C. Painter, chairman, Banquet Committee.

Standing L. to R.: Wilfred Cote, projection and public address system; John W. Barrett, assistant to Arrangements Committee chairman; John Fedkiw, forestry films; Floyd E. Carlson, chairman, Registration and Welcome Committee; Howard C. Miller, chairman, Meeting Rooms and Ushering Committee; Paul F. Graves, chairman, Hotel and Housing Committee; Neil J. Stout, member, Alumni Reunion (Syracuse) Committee; Ralph G. Unger, Information and Publicity Committee chairman; C. Eugene Farnsworth, chairman of Field Trips Committee; Harold G. Wilm, chairman, College of Forestry Reception Committee.

Paul M. Dunn, chairman of the Program Committee, and Russell C. Deckert, chairman of the Exhibits Committee, were unable to be present.

Report of the Granite State Chapter, New England Section

Editor's note. The following report was submitted to the New England Section on March 7, 1957. It is published here as an example of the kind of report that keeps the Section officers informed of Chapter activities.

Mr. Chairman, Section Members:

At the request of the Chairman of the New England Section, I wish to submit the following report on activities of the Granite State Chapter.

This month marks the fifth anniversary of our organization having received authorization from the New England Section at the winter meeting in 1952. Since that initial meeting of some thirty men, interest and membership in the Chapter have grown. Nearly all of the professional foresters of the state are members, with meeting attendance averaging approximately 50 men.

As in the past we have endeavored to hold four regular meetings a year, with field trips during the summer months and indoor sessions in the winter. Activities of the Chapter during the past year have included one field trip on the holdings of the Champion-International Company, on which discussion centered on problems and prospects of integrated operations running heavily to hardwoods.

Indoor sessions consisted of several able speakers and discussions. Of note was our annual meeting held at the University of New Hampshire where the staff of the Forestry School described current forest research projects at the University. The Chapter is greatly interested in the University School of Forestry and has an Educational Committee working in conjunction with the staff to determine what steps are necessary for the accreditation of the University by the Society of American Foresters.

The Legislative Committee was appointed to keep officers of the Chapter informed of any bills pertaining to forestry entered in the New Hampshire legislature. Some very important legislation has been supported by resolutions expressing the opinion of our group.

Through our contribution it was possible for two male high school students interested in forestry to receive scholarships to the 1956 Youth Conservation Camp.

In closing, I would like to add the benefits of a Chapter are many. It affords an excellent opportunity for the foresters of New Hampshire to discuss problems and subjects of mutual interest; it has created a general feeling of good will among members and I am happy to say several men have renewed interest in our parent Society through Chapter activity.

Thank you.

ALLAN W. PLUMB
Chairman

Coming Events

Gulf States Section

The Gulf States Section will hold its 1957 meeting at the Jung Hotel, New Orleans, La. on May 9-10.

Penn State 50th Anniversary

The 50th anniversary of forestry education in Pennsylvania will be celebrated at the University, University Park, May 27-28.

Forest Products Research Society

The Forest Products Research Society will hold its national annual meeting June 24-27 in Buffalo, N. Y., at the Hotel Statler.

Society of American Foresters

The 57th annual meeting of the Society of American Foresters will be held November 10-13, 1957 in the Syracuse Hotel, Syracuse, N. Y.

Sponsor Hardwood Sawlog Grading Symposium

The Central States Section is sponsoring a symposium on hardwood sawlog grades June 10 and 11, 1957, at the Hotel Warren, Indianapolis, Ind.

Foresters who attend will hear results of a recent comparative study made by the Illinois and Purdue Agricultural Experiment Stations on the hardwood sawlog grading systems developed by the U. S. Forest Products Laboratory and Purdue University Department of Forestry.

Log-grading authorities in the eastern part of the United States also have been asked to present reports on various aspects of grading hardwood sawlogs, how industry grades sawlogs, evaluating quality in the standing tree,

and teaching log grading. A final session on "Where Do We Go From Here?" will be held.

C. S. Walters, chairman of the Central States Section, announced that F. B. Clark, U. S. Forest Service, Bedford, Ind., will be chairman of the symposium.

Honorary Members

The Society's Constitution, Article 3, Section 10 provides that "Honorary Members shall be (1) persons not foresters who have rendered distinguished service to forestry either in America or abroad, or (2) professional foresters of outstanding achievement whose field of work lies outside of, and who are not citizens of, the United States, its possessions, or Canada."

A list of the current Honorary Members and the country of their residence follows:

Enrique Beltran, Mexico.
H. R. Blanford, England.
H. G. Champion, England.
Charles Colomb, France.
Wilson M. Compton, Herndon, Va.
Newton B. Drury, Berkeley, Calif.
Philibert Guinier, France.
F. B. Hubachek, Chicago, Ill.
Julio Riquelme Inda, Mexico.
D. Y. Lin, China.
Aldo Pavari, Italy.
Wilson Popenoe, Honduras.
C. R. Ranganathan, India.
William Starke Rosecrans, Los Angeles, Calif.
Eino Saari, Finland.
E. P. Stebbing, England.
Florencio Tamesis, Philippines.
Tom Wallace, Louisville, Ky.
Laurence F. Whittemore, Concord, N. H.

Honorary Member Expresses Appreciation

The following letter was received from Mr. D. Y. Lin, Chung Chi College, Hongkong, upon notification of his election by the Council of the SAF as an Honorary Member.

I acknowledge with thanks your letter of February 6th, informing me of my election as an Honorary Member of the Society of American Foresters.

This information is a source of joy and inspiration to me.

You, foresters in America, have certainly played an exemplary role in the "Fight for Conservation" and I consider it a great honor and privilege to be elected an Honorary Member of your Society and to be counted as one of you.

Thanking you and your Council for the honor and with very cordial greetings to all the members of your Society.

I remain,

Yours sincerely,
/s/ D. Y. Lin

C. J. Buck (1881-1956)

C. J. Buck, 75, of Portland, Ore., died December 30 as a result of a heart attack. He was born October 16, 1881 in Stockbridge, Mass.

A 1905 graduate of Yale University, he began working in forestry in the early 1900's with the federal government. Early in his career he was made supervisor of Medford (later Rogue River) National Forest. After several more advancements he became Regional Forester of Region 6 in 1930.

In 1939 he was transferred to the Washington, D. C. office as the chief forester's general inspector and special assistant. He remained in that position until his retirement in 1947.

R. T. Ferguson (1885-1957)

R. T. Ferguson of Phoenix, Ariz. died in February at the age of 71.

Mr. Ferguson graduated from Washington and Jefferson College in 1908 with a BS degree in engineering and then continued his studies for one year at the University of Michigan, changing his major field to forestry.

In 1910 he went to work as a forest ranger on the Deerlodge National Forest and spent most of his career with the U. S. Forest Service. In 1936 he became forest supervisor of Lewis and Clark National Forest, Great Falls, Mont., and retired from that position in July 1947. Prior to that, he served as forest supervisor of Deerlodge and Beartooth National Forests.

Mr. Ferguson was born June 14, 1885 in Washington, Pa. He was elected to Senior Membership in the Society in 1923.

F. W. Godden (1901-1957)

F. W. Godden of Alexandria, Va., died on March 13, at the age of 55.

At the time of his death, Mr. Godden was assistant chief of the Division of Cooperative Forest Protection of the U. S. Forest Service in Washington, D. C.

He began his career with the Forest Service in Boise and Salmon, Idaho, after receiving his BSF degree from the University of Idaho that year.

Mr. Godden was born in Elkport, Iowa November 8, 1901. He joined the Society in 1936 and became a Senior Member in 1942.

Membership Applications and Advancements

Proposals for admission, advancement, and reinstatements received in the Society office during the month of March are listed below.

Action on the eligibility of those proposed for membership as listed below will be taken by the Council as of June 1, 1957. Communications from voting members regarding the membership eligibility of these persons should be received in the Society office prior to that date.

Allegheny Section

Student Grade

Pennsylvania State University

Frank, A. J. — Loftus, N. S.
Grube, W. R. — Seitz, R. C.
Hollenbaugh, W. C. — Seman, T. R.
Klein, E. L. — Sikorski, M.
Krieger, F. C. — Smith, T. W.
Lockard, W. H. — Wermlinger, D. E.
Zimmerman, J. R.

West Virginia University

Bayless, J. M. — Pawlowski, R. T.

Junior Grade

Kitch, J. H., Service Forester, Pa. Dept. of Forests & Waters, Port Kennedy, Pa.; Pa. State, B.S.F., 1950.

Kunkel, O. W., Asst. Forester, Dept. of Cons. & Econ. Dev., Trenton, N. J.; Rutgers Univ., B.S., (Agric. & Forestry), 1940. (Affiliate 1954).

Rossman, W. R., 423 Belmont St., Johnstown, Pa. Reinstatement.

Appalachian Section

Junior Grade

Smith, J. D., Rt. 4, Amherst, Va.; V. P. I., B.S., (Cons. & Forestry), 1943; Duke Univ., M.F., 1949.

Member Grade

Haught, A. E., Grad. Student, N. C. State, Raleigh, N. C.; W. Va. Univ., B.S.F., 1952. (Junior 1952).

Affiliate Grade

Reynolds, R. A., Asst. Ranger, USFS, Norton, Va.; Univ. of N. H., B.S., (Forestry), 1952.

Central Rocky Mountain Section

Student Grade

Colorado A & M College

Crews, T. C. — DeBerard, D. J.
Sloniker, E. V.

Central States Section

Junior Grade

Lennertz, F. A., Box 201, Center, Texas; Purdue Univ., B.S.F., 1957. (Student 1955).

Member Grade

Nelson, R. E., Assoc. Ext. Forester, Univ. of Ill., Urbana, Ill.; Mich. State, B.S.F., 1936. (Junior 1952).

Overholt, D. P., Forestry Specialist, Soil Cons. Serv., Athens, Ohio. (Junior 42R57).

Whitmore, R. A., Forest Economist, USFS, New Philadelphia, Ohio; Univ. of Mich., B.S.F., 1952; M.F., 1954. (Junior 1952).

THE KENTUCKY-TENNESSEE SECTION bestowed its 1956 Forestry Recognition Award upon Mrs. J. Kidwell Grannis, Flemingsburg, Ky., at the Winter Meeting of the Section, held at Cumberland Falls State Park. Mrs. Grannis has an outstanding record in participation and support of important conservation programs and activities throughout Kentucky. On the left is John H. Hinton, Jr., chairman of the Forestry Recognition Award Committee, and making the award is Harry Nadler, associate director, Kentucky Division of Forestry.

Affiliate Grade

Werhane, E. F., Farm Forester, State of Ill., Anna, Ill.; Mich. College of Mining & Tech., B.S., (Forestry), 1954.

Columbia River Section

Student Grade

OREGON STATE COLLEGE

Sigler, C. K.

Junior Grade

Anderson, J. E., Forester, Pilot Rock Lbr. Co., Pilot Rock, Ore.; Univ. of Wash., B.S.F., 1950.

Hines, L. C., Tbr. Cruiser, Long-Bell Div. of International Paper Co., Eugene, Ore.; Ore. State, B.S.F., 1951.

Member Grade

Berntsen, C. M., Research Forester, USFS, Corvallis, Ore. (Junior 1950).

Bonney, M. C., Forester, Long-Bell Div., Longview, Wash. (Junior 36R56).

Callahan, D. T., Forester, Crown Zellerbach, Molalla, Ore. (Junior 1950).

Clark, D. W., Forester, B.I.A., Klamath Agency, Ore. (Junior 1950).

Evans, J. D., Forester, Bureau of Land Mgmt., Eugene, Ore. (Junior 1950).

Hansen, G. M., 623 S. W. Oak, Portland, Ore. (Junior 1950).

Hicks, W. S., Forester, C-Z Family Camp, Cathalmet, Wash. (Junior 1950).

Jefferies, G. K., Dist. Ranger, USFS, Joseph, Ore. (Junior 1950).

Kintigh, R. G., Consulting Forester, Eugene, Ore. (Junior 43R56).

Larson, L. H., Forester, USFS, Glide, Ore. (Junior 1950).

Malmberg, D. B., Private Forester, Bellevue, Wash. (Junior 1948).

Minato, A. E., Consulting Forester, Grants Pass, Ore. (Junior 1950).

Pearson, E. D., State Inspector, Eugene, Ore. (Junior 1950).

Powell, L. W., Prof., Ore. State, Corvallis, Ore. (Junior 1950).

Price, F. E., Forest Eng., USFS, Rhododendron, Ore. (Junior 1950).

Proud, O. R., Dist. Forester, Weyerhauser Tbr. Co., Kelso, Wash. (Junior 1950).

Riddagh, D. W., Forester, Bureau of Land Mgmt., Eugene, Ore. (Junior 1950).

Rowley, M. L., Box 278, Philomath, Ore. (Junior 1950).

Schroeder, R. E., Forester, Bureau of Land Mgmt., Portland, Ore. (Junior 1950).

Smith, C. W., Rehabilitation Field Asst., Ore. State Board of Forestry, Forest Grove, Ore.; Ore. State, B.S.F., 1952. (Junior 1952).

Smith, G. S., Dist. Asst., USFS., Prineville, Ore.; Ore. State, B.S.F., 1952. (Junior 1952).

Stekiel, R. J., Forester, USFS, Kelso, Wash. (Junior 1950).

Stoop, J. H., Forester, Ginstina Bros. Lbr. Co., Eugene, Ore. (Junior 48R54).

Affiliate Grade

Abrenietis, V. V., Forester, Bureau of Indian Affairs, Warm Springs, Ore.

Banko, C. F., Forester, USFS, Blue River, Ore.; Wash. State, B.S., (Wildlife Mgmt.), 1950.

Hurst, C. H., Forester, Bureau of Land Mgmt., Medford, Ore.; Univ. of Calif., B.A., (Forestry & Zoology), 1952.

Paulsen, C. B., Forester, Crown Zellerbach Corp., Seaside, Ore.

Gulf States Section

Student Grade

LOUISIANA POLYTECHNIC INSTITUTE

Auld, A. B.

Junior Grade

Bace, A. C., General Mgr. & Owner, Tex-La Land Mgmt. Service, Kirbyville, Texas; Okla. A & M, B.S., (Forestry), 1951. (Affiliate 1953).

Skillern, L., Dist. Forester, Southwestern Settlement & Dev. Co. Silsbee, Texas; Stephen F. Austin State College, B.S., (Forestry), 1950. (Affiliate 1953).

Stewart, W. B., Senior Block Forester, Olin Mathieson Chem. Corp., Winnfield, La.; La. State, B.S.F., 1950.

Thatcher, R. C., Entomologist, Southern Forest Expt. Sta., Nacogdoches, Texas; State Univ. of N. Y., B.S.F., 1953.

Washburn, F. E., Nursery Supv., Newton, Texas. Reinstatement.

Member Grade

Adkins, F. E., Area Forestry Supv., Masonite Corp., Laurel, Miss. (Junior 1950).

Bowling, D. R., Forester, Masonite Corp., Laurel, Miss. (Junior 1950).

Cech, F. C., Asst. Silviculturist, Texas Forest Service, Rusk, Texas. (Junior 1950).

Compton, C. W., Dist. Forester, International Paper Co., Brookhaven, Miss. Junior 1950).

McDonald, C. R., Tbr. Mgmt. Supv., Johns-Manville Corp., Natchez, Miss. (Junior 1950).

Norman, D. R., Dist. Forester, Masonite Corp., Meridian, Miss. (Junior 1950).

Odom, J. D., Forester, International Paper Co., Brandon, Miss. (Junior 1950).

Price, J. H., Scale Coordinator, International Paper Co., Natchez, Miss. (Junior 1950).

Sumrall, J. E., Field Asst., International Paper Co., Hattiesburg, Miss. (Junior 1950).

Tobermann, J. R., Field Asst., International Paper Co., Dekalb, Miss. (Junior 1950).

Affiliate Grade

Dillon, J. L., Dist. Forester, Kirby Lbr. Corp., Silsbee, Texas; Stephen F. Austin State College, B.S., (Forestry), 1954.

James, C. R., Block Forester, Lutcher & Moore Lbr. Co., Fields, La.; Stephen F. Austin State College, B.S., (Forestry), 1950.

Maynard, D. E., Forester, Southern Pine Lbr. Co., Diboll, Texas; Stephen F. Austin State College, B.S., (Forest Mgmt.), 1951.

McKinley, C. L., Forester, International Paper Co., Doucette, Texas; Stephen F. Austin State College, B.S., (Forestry), 1952.

Nichols, B. G., Asst. Chief Forester, Southern Pine Lbr. Co., Pineland, Texas; Stephen F. Austin State College, B.S., (Forestry), 1949.

Stovall, J. N., Forester, Texas Pine Inc., Bellaire, Texas; Stephen F. Austin State College, B.S., (Forestry), 1955.

Welch, E. M., Dist. Forester, Southland Paper Mill, Groveton, Texas; Stephen F. Austin State College, B.S., (Forestry), 1953.

Inland Empire Section

Student Grade

UNIVERSITY OF IDAHO

Smith, T. W. R.

Intermountain Section

Junior Grade

Kobelin, D. W., Forester, Bureau of Land Mgmt., Boise, Idaho; Wash. State, B.S., (Forestry), 1951. (Affiliate 1952).

New England Section

Student Grade

UNIVERSITY OF MAINE

Waite, D. A.

UNIVERSITY OF MASSACHUSETTS

Morrison, W. A.

Junior Grade

Anderson, A. M., Dist. Forester, Dept. of Lands & Forests, Liverpool, N. S., Canada; Univ. of New Brunswick, B.S., (Forest Engr.), 1952; State Univ. of N. Y., M.F., 1957.

Mader, D. L., Asst. Prof., Univ. of Mass., Amherst, Mass.; State Univ. of N. Y. B.S.F., 1950; Univ. of Wis., M.S., (Soils), 1954; Ph.D., 1956.

Mullavey, R. E., Dist. Ranger, USFS, Manchester Center, Vt.; Univ. of N. H., B.S., (Forestry), 1948. (Affiliate 1954).

Putnam, E. L., Forester, Great Northern Paper Co., Bangor, Maine; Univ. of Maine, B.S.F., 1957. (Student 1956).

Swenson, C. L., Service Forester, Maine Forest Service, South Paris, Maine; Univ. of Maine, B.S.F., 1952.

Member Grade

Catheron, A. G., Forester, Appalachian Sylphides, Inc., South Strafford, Vt.; Univ. of Maine, B.S.F., 1951. (Junior 1952).

New York Section

Student Grade

STATE UNIVERSITY OF NEW YORK

Yamrick, W. F.

Junior Grade

Sawyer, R. F., Forester, International Paper Co., Lowville, N. Y.; State Univ. of N. Y., B.S.F., 1950.

Member Grade

Shearer, T. D., Forester, N. Y. State Cons. Dept., Herkimer, N. Y.; State Univ. of N. Y., B.S.F., 1949. (Junior 1952).

Affiliate Grade

Sand, R. M., Forester, Cottoh-Hanlon, Inc., Cayuta, N. Y.; State Univ. of N. Y., B.S., (Utilization), 1950.

Northern California Section

Student Grade

UNIVERSITY OF CALIFORNIA

Burns, D. M. Hammitt, J. H.
Poppin, N. J.

Junior Grade

Weinberg, E. E. A., Forester, USFS, North Fork, Calif.; State Univ. of N. Y., B.S.F., 1953; M.F., 1956.

Member Grade

Heyer, J., Asst. Dist. Forester, Southern Pacific Land Co., Auburn, Calif.; Univ. of Calif., B.S.F., 1941. (Junior 1952).

Scherf, J. J., Forester, Masonite Corp., Ukiah, Calif.; Purdue Univ., B.S.F., 1951. (Junior 1952).

Weaver, R. W., Asst. State Forest Ranger, Calif. Div. of Forestry, King City, Calif.; Univ. of Calif., B.S.F., 1950. (Junior 1952).

Affiliate Grade

Ryder, G. H., Forestry Trainee, State of Calif., Orick, Calif.

Waklee, C. W., Forestry Trainee, State of Calif., N. Sacramento, Calif.

Ozark Section

Junior Grade

Foster, C. C., Asst. Dist. Forester, International Paper Co., Hampton, Ark. (Affiliate 1952).

Hanna, J. N., Dist. Forester, Crossett Lbr. Co., Crossett, Ark.; Okla. A & M, B.S., (Forest Mgmt.), 1950. (Affiliate 1953).

Herron, Q. H., Asst. Mgr., Herron Industries, Idabel, Okla.; Okla. A & M, B.S., (Forestry), 1951. (Affiliate 1951).

Peebles, E. G., Dist. Forester, Dierks Forests Inc., Broken Bow, Okla.; Okla. A & M, B.S., (Forestry), 1950. (Affiliate 1951).

Member Grade

Johnson, L. R., Forester, Ashe Nursery, Brooklyn, Miss. (Junior 1950).

Tyson, R. L., Asst. Dist. Forester, Mathew Allen Memorial Forest, DeQueen, Ark.; L. P. I., B.S.F., 1951. (Junior 1953).

Affiliate Grade

Clanton, H. W., Unit Forester, International Paper Co., Hampton, Ark.

Davenport, W. H., Forest Tech., International Paper Co., Sheridan, Ark.

Puget Sound Section

Student Grade

UNIVERSITY OF WASHINGTON

Fagerberg, K. D. Jordan, D. H.

Junior Grade

Beach, D. F., Junior Forester, USFS, Darrington, Wash.; Pa. State, B.S.F., 1953.

Overdorff, W. R., Forester, USFS, Juneau, Alaska; Mont. State, B.S.F., 1955.

Member Grade

Ostrowski, P. F., Asst. Forester, West Tacoma Newsprint, Cosmopolis, Wash.; Univ. of Wash., B.S.F., 1951. (Junior 1951).

Affiliate Grade

Britt, T. V., Promotion Sales Rep., Harbor Plywood Corp., Aberdeen, Wash. Reinstatement.

Associate Grade

Billings, F., Public Rec. Adm., Weyerhaeuser Tbr. Co., Tacoma, Wash.

Southeastern Section

Student Grade

UNIVERSITY OF GEORGIA

Tyre, R. L. Wilson, J. R.

Member Grade

Langdale, J. J., Forest Mgr., J. W. Langdale Co., Council, Ga.; Univ. of Ga., B.S.F., 1951. (Junior 1951).

Morrow, H. L., Forester, U. S. Pipe Co., Russellville, Ala. (Junior 1950).

Upper-Mississippi Valley Section

Student Grade

IOWA STATE COLLEGE

Ficke, J. E. Rasmuson, D. A.

Member Grade

Aultfather, W. A., Consulting Forester, Austin, Minn.; Univ. of Minn. B.S.F., 1950. (Junior 1951).

Washington Section

Affiliate Grade

Leonard, J. G., Cartographer, USFS, Alexandria, Va.; V. P. I., B.S., (Forestry & Wildlife Cons.), 1950.

Wisconsin-Michigan Section

Junior Grade

Basinger, J. A., 407 N. Wayne St. Piqua, Ohio; Mich. State, B.S.F., 1956. (Student 1955).

Cross, R. L., Research Forester, USFS, Marquette, Mich.; Mich. College of Mining & Tech., B.S., (Forestry), 1952; Mich. State, M.S., 1956. (Affiliate 1953).

Ehlen, R. R., Gen. Del., Summerville, S. C.; Mich. State, M.S., 1956. (Student 1955).

Hitt, W., 4180 Valley Forge Rd., Birmingham, Mich. Reinstatement.

Potter, H. L., Asst. Dist. Forester, State of Mich., Baraga, Mich.; Mich. State, B.S.F., 1950.

Affiliate Grade

Parmeter, J. R., Pathoiogist, USFS, Rhinelander, Wis.; Ore. State, B.S., (Botany & Forestry), 1951; Univ. of Wis., Ph.D., (Plant Pathology), 1955.

Pronin, D. T., Biological Aide, USFS, Madison, Wis.

Robert, K. P., Asst. Dist. Forester, Wis. Cons. Dept., Oregon, Wis.; Mich. College of Mining & Tech., B.S., (Forestry), 1956.

No Section

Affiliate Grade

Watson, A. W., Chief Field Eng., BRW, A. P. O., N. Y., N. Y.; State Univ. of N. Y., B.S., (Utilization & Distribution), 1951.

Corresponding Grade

Delizo, T. C., Prof., Univ. of the Philippines, College, Laguna, Philippines; Univ. of the Philippines, B.S., (Forestry), 1934.

Fuentes, J. M., Field Asst., International Paper Co., Brookhaven, Miss.; Univ. of Chile, A. E., (Agronomy), 1942; Univ. of Mich., M.F., (Forestry), 1951.

La Cruz, E., Chief, Forest Products Lab., Bureau of Forestry, College, Laguna, Philippines; Univ. of Idaho, B.S.F., 1926; Yale, M.F., 1927.

Liao, T., Junior Specialist, Taiwan Forestry Adm., Taipei, Taiwan, China; Provincial College of Agric., B.S., (Forestry), 1951.

Mao, C. C., Asst. Chief, Provincial Government of Taiwan, China; Chiao-Tung Univ., B.S., (Electrical Eng.), 1938; B.S., (Mechanical Eng.), 1939.

Peng, P. L., Forester, Vocational Asst. Comm. for Retired Servicemen, Taipei, Taiwan, China; Univ. of Nanking, B.S., (Forestry), 1948.

Saur, W. W., Professor, Dept. of Agric. Servico Florestal Federal, Rio de Janeiro, Brazil; N. C. State College, M.F., 1954.

Journal of Forestry Policy on Publications

The following statement of policy on publications for the JOURNAL OF FORESTRY *was approved by the Council of the Society of American Foresters at its regular meeting held October 16, 1955 in Portland, Ore. It was subsequently published in the January 1956 issue of the* JOURNAL *under the report of the Council meeting.*

It is again reproduced here for the information of Society members.

The Constitution of the Society of American Foresters directs that "The Society shall publish (1) a monthly technical forestry periodical known as the JOURNAL OF FORESTRY. . ."

1. The principal functions of the JOURNAL OF FORESTRY are to serve as a forum for discussion of research, practice, and development in all branches of forestry; to provide a medium for exchange of professional thought including matters of policy affecting forestry; to serve as a repository for professional knowledge; and to represent, advance, and protect the interests and standards of the profession of forestry. Secondary functions may include dissemination of current news of people and events in forestry and, when prescribed by the Council, publication of internal Society matters known as Society Affairs.

2. As the practice of forestry is founded upon its sciences, we will strive to keep our readers informed of significant findings in basic research through the publication of material that is accurate, competently prepared, and up-to-date. We will insist that authors give full credit to others, so far as their knowledge goes, for procedures and methods devised or discovered and ideas advanced or aid given. We will render all possible assistance to authors in so doing.

3. Realizing that the practice of forestry, though based on its sciences, is equally concerned with the application of knowledge obtained, we will also strive to present material of day-to-day job application by practicing foresters, including material of general interest to the profession.

4. We will endeavor to present a balance of published material involving specific subject matter fields and regional interests.

5. We will discourage exhaustive discussion of individual opinions in matters of interest to only a limited number of readers as well as publication of material that is by its nature restricted in application, deals with matters of general knowledge to the profession, or consists of abstractions or philosophical speculations that are not original or that do not contribute to the principal functions of the JOURNAL.

6. We will demand of our contributors (a) something worthwhile to say, (b) their best efforts in presenting it in a readable and interesting way, and (c) that they demonstrate clearly its present or potential significance to the science or practice of forestry.

7. We, and all who contribute to our pages, are free to express what we think. We shall not, in order to please anyone, say anything that we do not believe to be true or repress any criticism that we honestly believe to be just. We will strive always for the maintenance of courtesy and good temper, and we will not permit the publication of criticisms that verge on harshness of expression or that deal with personalities.

8. While encouraging members of the profession to assume their rights and duties as individual citizens, we will insist that discussions of forest policy be presented in such a manner as to avoid confusion with partisan political policies.

9. We will encourage the younger members of the profession to contribute to professional literature and will render such aid as is possible to them.

Section Box Score 1957 Membership

Section	Applications received[1] May 1957	Total 1956	Total 1957
Allegheny	16	58	54
Appalachian	2	58	12
Central Rocky Mountain	3	32	18
Central States	1	42	8
Columbia River	7	77	34
Gulf States	10	79	25
Inland Empire	1	32	3
Intermountain	0	35	4
Kentucky-Tennessee	0	12	4
New England	5	61	26
New York	3	45	32
Northern California	6	67	14
Northern Rocky Mountain	0	31	41
Ozark	2	19	46
Puget Sound	5	44	34
Southeastern	2	92	91
Southern California	0	2	2
Southwestern	0	2	1
Upper-Mississippi Valley	2	72	42
Washington	1	1	10
Wisconsin-Michigan	4	102	26
Totals	70	963	527

[1]Students, Junior, Affiliate, Associate (Initial) grades only.

School Box Score 1957 Membership

School	Student applications received May 1957	Total 1956	Total 1957
Alabama Polytechnic Institute	0	6	19
University of California	3	53	9
Colorado A & M College	3	28	13
Duke University	0	7	3
University of Florida	0	25	4
University of Georgia	2	30	55
University of Idaho	1	21	3
Iowa State College	2	31	14
Louisiana Polytechnic Institute	1	27	1
Louisiana State University	0	22	12
University of Maine	1	13	11
University of Massachusetts	1	20	1
Michigan State University	0	50	9
University of Michigan	0	24	7
University of Minnesota	0	26	25
University of Missouri	0	2	35
Montana State University	0	17	39
State University of New York	1	38	23
North Carolina State College	0	24	1
Oregon State College	1	44	18
Pennsylvania State University	13	35	25
Purdue University	0	36	2
Utah State Agricultural College	0	28	4
University of Washington	2	21	15
West Virginia University	2	5	19
Yale University	0	13	5
Totals	33	646	372

GEORGIA—PACIFIC
CORPORATION

11 SAWMILLS TO SERVE YOUR NEEDS WITH QUALITY LUMBER

CLEVELAND, S. C. • DUMAS, ARK. • FAIRFAX, S. C.
JACKSON, MISS. • STEELWOOD, ALA. — Southern and Appalachian Hardwoods. Shortleaf and Longleaf Yellow Pine and Cypress—Air Dried and Kiln Dried.

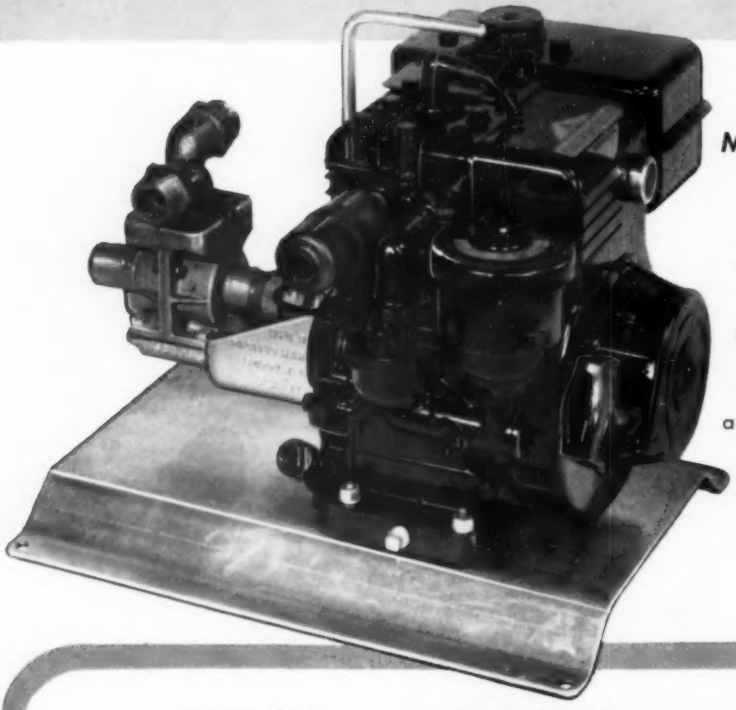
TOLEDO, COOS BAY, MILLINGTON, OREGON — Douglas Fir, West Coast Hemlock and Sitka Spruce. Rail and water shipments—Kiln Dried Mixed Cars and Cut Stock.

FEATHER FALLS, CALIFORNIA — Sugar Pine, Ponderosa Pine and White Fir—Kiln Dried Pattern Lumber and Flask Stock—Our Specialty.

SAMOA, EUREKA, CALIFORNIA — Redwood, Douglas Fir

SALES OFFICES: Southern Lumber, Southern Finance Building, Augusta, Georgia
Western Lumber, Equitable Building, Portland 4, Oregon

INTRODUCING . . .
FROM PACIFIC PUMPERS



MODEL "BE" PUMPER

Here's the newest member of a line famous the world over for quality and dependability. The "BE" is a lightweight pumper, simple in construction, easy and inexpensive to operate and maintain. Engineered and designed for fire suppression, spraying and general purpose use. Naturally the "BE" is built to the same exacting specifications that have made Pacific Pumpers first choice for over 35 years.

DIMENSIONS

Length	**17½"**
Width	**15"**
Height	**14"**
Net Weight	**39 lbs.**

PUMPER PERFORMANCE

Pressure	50	100	150	180
Gal. per min.	11	10	9	8

PUMPER CONSTRUCTION

ENGINE: Briggs & Stratton one cylinder, 4-cycle, air-cooled.

POWER RATING: 2.25 h.p. at 3600 RPM.

STARTING: Recoil type.

IGNITION: Patented high tension, built-in flywheel magneto, moisture and dust proof.

SPECIAL ENGINE FEATURES:

- Stellite exhaust valves with rotocaps.
- Shielded spark plug.
- Push-button stop switch.
- Fuel filter and sediment pump.
- Oil bath air cleaner.
- Adjustable pneumatic type governor.
- Low back pressure type muffler.

PUMP: Eco rotary positive displacement type, self-priming.

List Price F.O.B. Seattle

CONSTRUCTION: Naval bronze housing, neoprene impellers and shaft seals, monel shaft and eccentrics.

SUCTION AND DISCHARGE:

- 1" parallel I.P.T. (std).
- Garden hose thread available when specified.
- Special oil resistant rubber impellers for pumping certain chemicals are available when specified.

$145

Write for a catalog of all our Fire Suppression Equipment

PACIFIC MARINE SUPPLY COMPANY

1223 Western Avenue • Seattle, Washington

Forestry News

Harrar Succeeds Korstian as Dean of Duke Univ. Forestry School

Dr. E. S. Harrar has been named dean of the Duke University School of Forestry, President Hollis Edens has announced.

Dr. Harrar will succeed the School's founding dean, Clarence F. Korstian, who will reach retirement age in August 1958, and who has asked to retire from the deanship in order to permit a smooth continuity of administration and transfer of duties. Dr. Korstian will remain on the forestry faculty as professor of silviculture until he retires. Dr. Harrar's appointment as dean became effective March 1. He was at that time professor of wood technology at Duke, on whose faculty he has served since 1936.

Last December, Dr. Harrar was appointed to the Task Group on Forest Products of President Eisenhower's Commission on Increased Industrial Use of Agricultural Products. He has served as secretary-treasurer of the International Society of Wood Anatomists and as an executive board member of the forest Products Research Society.

His other professional and honorary memberships include the Alpha Xi Sigma national forestry honorary society and Sigma Xi scientific research society.

Dr. Harrar has written extensively and is co-author of a number of books that include *Textbook of Dendrology, Guide to Southern Trees, Forest Dendrology,* and *Forest Products.* Also he has written articles on timber trees of the world for the *Encyclopedia Britannica.* The first volume of his *Encyclopedia of American Woods* is scheduled for publication this spring.

Born in Pittsburgh, Pa., Dr. Harrar was reared in Ohio. He studied at Oberlin College and received the B.S., M.S., and Ph.D degrees from the New York State College of Forestry. Before going to Duke in 1936, he taught at the University of Washington College of Forestry. He served during World War II as chief administrative engineer with the Airplane Division of the Curtis-Wright Corporation in Louisville, Ky.

Dr. Korstian, who has been dean of the Forestry School since 1938, came to the University in 1930 as professor of silviculture and director of the Duke Forest.

E. S. Harrar

Interior Reports on 1956 Fire Season

The calendar year 1956 forest and range fire losses for the Department of the Interior lands were in general considerably more than those in 1955 but below the average annual loss for the previous ten years.

The total number of fires was 2,818 which is 859 more than the number during the previous year, thereby representing a 43 percent increase. Likewise, this was 387 fires more than the average annual number of fires for the past ten years. The area of federal and Indian land burned over during 1956 was 631,375 acres as contrasted to 464,876 acres in 1955 and with the average annual loss of 1,046,093 acres during the past ten years.

The number of man-caused fires increased slightly, with 1,256 fires reported for 1956 as compared to 1,166 reported in 1955. However, the cumulative average number of man-caused fires continues to show a decrease.

The number of lightning fires increased tremendously during the year; in fact there were reported approximately twice as many lightning-caused

PLANTING TREES ?

Use a "FORESTER" or "CONSERVATOR" Planter

Complete information on request

UT&BCo — Builders of Dependable Equipment Since 1935

UTILITY TOOL & BODY CO.

Clintonville, Wis.

METEOROLOGICAL SERVICE

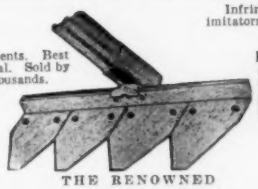
Fire Danger Rating . . . Weather Modification
Forecasts and Advisories . . . Instruments

J. B. "Ben" Melin, 2806 32nd Ave., S., Seattle 44, Wash.
R. Kirkpatrick, 1805 N.E. 141st Ave., Portland 20, Ore.

Infringers and imitators warned.

3 Patents. Best material. Sold by the thousands.

Best Chrome Steel Strong, Durable



THE RENOWNED
CHARLES H. RICH
"Forest Fire Fighting Tool"
Write for Prices and Descriptions

C. H. RICH FOREST FIRE TOOL CO.
218 W. Bald Eagle St.
Lock Haven, Pa.

THE LOWTHER
TREE PLANTER PLANTS
10,000 SEEDLINGS PER DAY!

With the Lowther Tree Planter, trees are properly planted for maximum survival in any soil because they have been given the right start.
Three distinct models available to cover all soil conditions and terrain.

For details, write:

THE HARRY A. LOWTHER COMPANY

INDUSTRY AVE., JOLIET, ILL.

By The Makers Of The Famous Lowther C-Saw

the NEW

POULAN F MODEL

- Light-weight
- Fast-cutting
- Precision-built

IT'S YOUR BEST DOLLAR VALUE IN A ONE-MAN CHAIN SAW

PROFITABLE . . . Cuts labor, operating cost and downtime

DURABLE . . . Precision-machined from tough materials for minimum wear

VERSATILE . . . Straight or plunge-bow blades for all cutting requirements

POULAN
CHAIN SAWS

A QUALITY SAW!

SOUTH'S LARGEST CHAIN SAW MANUFACTURER

SHREVEPORT, LA.

fires in 1956 as in 1955 or 1,562 versus 830 and 953 for the ten-year average.

The Fish and Wildlife Service (now the Bureau of Sport Fisheries and Wildlife) reported better conditions during 1956 than in 1955.

The National Park Service, although reporting a considerable increase in the number of fires, principally lightning, was able to hold its losses to a very low level.

The Bureau of Indian Affairs, reported a considerable increase in the number of fires, again largely lightning-caused, and a loss of 100,747 acres which was some 40,000 acres greater than the previous year.

The Bureau of Land Management reported a rather excellent season in the Continental United States but in contrast reported severe conditions in Alaska during the year. A total of 467,721 acres of federally owned land was burned over in the Territory of Alaska.

22nd North American Wildlife Conference

Nearly 1,500 persons including renewable natural resources managers, conservation administrators, biologists, outdoor writers, and sportsmen attended the 22nd North American Wildlife Conference held March 4-6 in the Hotel Statler, Washington, D. C. The Wildlife Management Institute sponsors this annual meeting.

The theme of this year's conference was "Conservation Is Everyone's Business." Dr. Detlev W. Bronk, president, National Academy of Science, presided as chairman of the opening general session. He was assisted by Dr. Maurice K. Goddard, secretary of the Pennsylvania Department of Forests and Waters. Participating in a discussion of the topic, "The Professions' Stake in Conservation," were Alan T. Waterman, director, National Science Foundation; Lloyd E. Partain, Curtis Publishing Company; Right Reverend Robert M. Hatch, Suffragan Bishop of Connecticut; William F. Schulz, Jr., professor of law, University of Pittsburgh; and Arthur S. Adams, president, American Council on Education.

Palmer Hoyt, editor and publisher of the Denver *Post*, was chairman of the second general session. Assisting Hoyt was Lawrence W. Rathbun, forester of the Society of Protection of New Hampshire Forests. The theme of this session was "The Public's Stake in Conservation."

"Waterfowl Potentials," was the dis-

3 HALE
"WORK HORSES"
for
FIRE FIGHTING FORESTERS

	U. S. Gallons Per Minute	Disch. Press. Lbs. Per Sq. In.
*FZZ	60	90
	100	70
FZ	50	60
	300	10
HPZF	15	200
	45	100

*FZZ now has NEW — • Ball-Type Discharge Valve — • Improved Priming

These 3 Centrifugal pumping "Workhorses" provide a remarkable range of volumes and pressures for efficiently fighting a wide variety of fires. All three units are conveniently portable by two men; can be easily mounted or carried on any type of apparatus or truck for fighting fires while in motion from booster tank; often used to pump from

inaccessible water source into major pumper, or to fight fires direct through long line of hose.

Write today for circulars on Models FZZ, FZ and HPZF—at least one of which is sure to meet your fire fighting requirements. Ask for demonstration; no obligation.

HALE FIRE PUMP CO.
Conshohocken, Pa.

Below—HPZF shown in action.

cussion theme of the closing general session, under the chairmanship of Thomas L. Kimball, director of the Colorado Game and Fish Department.

Throughout the three-day meeting six technical sessions were devoted to specific problems in all phases of renewable natural resources management.

Michigan Announces Entrance Salary Increase

The Michigan State Civil Service Commission recently announced an increase in salary for foresters entering state service.

"The State Civil Service Commission in Michigan recently announced a new class for foresters starting employment with the Forestry Division, Department of Conservation. The class is called Forester Trainee I, and carries a yearly salary of $4,784. Upon satisfactory completion of the one year training program (six months with master's degree) and passing a required examination, the position is reallocated to the next higher classification in the series which is the Forester II, with a minimum salary of $4,992. Within the II class, four yearly step increases are provided, arriving at a maximum of $6,281.60. Advancement beyond this level is by promotion.

"The minimum educational requirements are graduation from an accredited college with a degree in forestry. The examination will be given by appointment and residence in Michigan is no longer required. The Michigan Civil Service Commission is located at 320 South Walnut Street, Lansing, Michigan."

Washington Creates Department of Natural Resources

The State of Washington recently adopted corrective legislation designed to solve the problems of forestry organization. The Governor signed a bill into law creating the State Department of Natural Resources. Under this new department a number of state divisions and agencies dealing with the management of state owned timber and land resources have been consolidated.

As stated in the act, the Department of Natural Resources will be operated by a five member board. The prime duties of the Board will be to establish policies to insure that the acquisition, management, and disposition of all lands and resources within the Department's jurisdiction are based on sound principles designed to achieve the maximum effective development and use of such lands and resources consistent with laws applicable thereto.

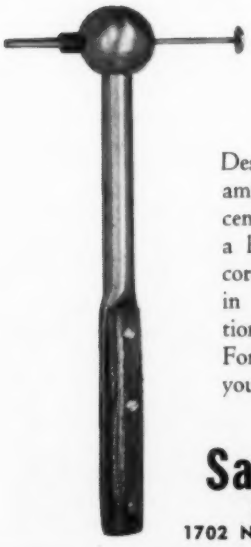
The State Department of Natural Resources has under its jurisdiction approximately three million acres of public land. About two million acres of these lands are suited to forest production. The remaining acreage, roughly one million acres, consists of agricultural and grazing lands, tide lands, oyster lands, shore lands, and oil, gas, and mineral lands.

Bert Cole, a former logger and the elected commissioner of public lands, will serve as secretary of the Board and as the administrator of the natural resources program. The legislation also provides for a supervisor appointed by the administrator with the advice and consent of the Board.

L. T. Webster, present supervisor for the State Division of Forestry, has been appointed to this new position. Under his direction six general administrative units have been set up to streamline the activities of the department. The units are defined under the general headings of Forest Management, Lands, Civil Engineering, Forest Engineering, Forest Fire Control, and Operations.

INCREMENT HAMMERS

MADE IN MORA, SWEDEN



- Accurate
- Fast
- Sturdy
- Weighs 13 oz.
- 10" long

Designed for quick, easy examination of bark and recent tree growth. Use like a hammer and extract ¾" core *instantly*. A timesaver in selective cutting operations. Your free copy of our Forester's Tool Catalog is yours for the asking.

Write Dept. J.

Sandvik STEEL INC.
SAW & TOOL DIVISION
1702 NEVINS RD., FAIR LAWN, N. J.

USDA Photo

Throughout the world, Lufkin measuring devices are the choice of Foresters and Lumbermen. The quality of these tools is unmatched for dependable, accurate measurements. Complete line includes Log Rules, Board Rules, Tree Tapes, Log Calipers, Lumber gages, Cruiser Sticks, Folding Log Rules and Steel Tapes.

BUY LUFKIN TAPES • RULES
PRECISION TOOLS
FROM YOUR SUPPLY HOUSE

THE LUFKIN RULE CO., SAGINAW, MICHIGAN
NEW YORK CITY • BARRIE, ONTARIO

FREE BOOKLET

The Lufkin Rule Co., Saginaw, Mich.
Gentlemen: Please send me your 12 page booklet on Lufkin Measuring Devices for the Lumber Industry.

NAME_____
ADDRESS_____
CITY_____ STATE_____

414

Standards of Excellence

. . . AERMOTOR OBSERVATION TOWERS

Across our nation, thousands of Aermotor Observation Towers stand silent watch—aiding in the struggle to guard our forests and woodlands.

Their records show years of faithful service—in crippling snowstorms—driving rains.

Aermotor is proud of this record . . . proud to know that—

"In Observation Towers, the Standard of Excellence is Aermotor."

AERMOTOR COMPANY
2500 W. Roosevelt Road Chicago 8, Illinois

Shield Yourself Against Chiggers & Ticks!

Ticks-Off repels and kills disease-carrying insects—ticks, chiggers, mosquitoes, black flies, many others. Fights Rocky Mountain Spotted Fever, Tick Fever, Rabbit Fever, etc. Used by U. S. Armed Services; U. S. and State forestry, wildlife, conservation depts.; outdoorsmen coast to coast. Lightly mist clothes and skin for all-day protection.

America's No. 1 Spray-On Insect Repellent

MINE SAFETY APPLIANCES CO.
54 Branches Everywhere
Home Office: Pittsburgh 8, Pa.

Public

Regional Forester in Ogden Retires

C. J. Olsen, regional forester of the U. S. Forest Service Intermountain Region, Ogden, Utah, retired on April 1 after 37 years in the Forest Service. He will be succeeded by Floyd Iverson of Ogden who has been in charge of the Range and Wildlife Division in the Region since 1955.

Richard E. McArdle, chief of the Forest Service in commenting on Mr. Olsen's retirement, said: "He has served with distinction in every step of the Forest Service career ladder from forest ranger to regional forester. His fine leadership has brought about some outstanding accomplishments in resource management in the Intermountain Region. Among these are—the application of forest research findings on the National Forests—particularly in the field of watershed management, restoration of 400,000 acres of range land, better timber cutting practices on private land as well as national forests, development of a timber access road program, and forest insect and control projects." For his outstanding contribution to rural life and the conservation of natural resources, Mr. Olsen, in 1955, received the Department's Superior Service Award.

Mr. Olsen was first employed by the Forest Service in 1919 as forest ranger in Nevada; he served in a similar position on the Fishlake National Forest in Utah and the Kaibab National Forest

C. J. OLSEN

in Arizona. In 1927 he became assistant supervisor of the Fishlake National Forest; he was promoted to supervisor in 1931—serving in this capacity on the Nevada, Toiyabe and Wasatch National Forests.

Between 1936 and 1950 he was assistant regional forester in charge of—first, the Division of Operation, then Recreation and Lands, and lastly Information and Education. In 1950 Mr. Olsen became regional forester in charge of the Intermountain Region.

Interior Department Nominates Forester for Career Service Award

John F. Shanklin is among five veteran employees of the Department of the Interior nominated for the third annual presentation of Career Service Awards to outstanding federal employees by the National Civil Service League.

The awards are granted to employees of the federal government who "exemplify in an outstanding manner the primary characteristics of the career service: competence, efficiency, character, and continuity of service."

In announcing the Department of the Interior nominations, Assistant Secretary Beasley gave the following information concerning Shanklin's nomination:

"John F. Shanklin is staff assistant for forestry in the Technical Review Staff, Office of the Secretary. The Technical Review Staff consists of experts in the diverse activities of the Department whose function is to provide the Secretariat with essential services within their specialized fields. Mr. Shanklin entered the Federal service in 1933 with a temporary appointment as forester in the emergency conservation

NEW REGULATION FIELD CLOTHES
for
U. S. FOREST SERVICE PERSONNEL
Complete Price List on Request
THE FECHHEIMER BROS. CO.
UNIFORMS FOR OVER 75 YEARS
CINCINNATI 2, OHIO

25 MILLION SEEDLINGS
McCURDY BROS. NURSERIES
MANTON, MICHIGAN

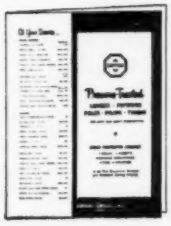
2507 years ago Aesop said:

"Please all and you will please none"

The job of Koppers Wood Preserving Division can be stated simply: "To produce and sell quality pressure-treated wood products." Nothing else!

As specialists in this field Koppers is a leader in scientific forestry and the pressure preservation of wood. And to keep leadership, Koppers maintains rigid quality control standards—from timberland to delivery.

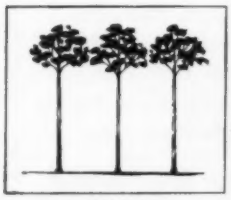
That's why users everywhere can depend on Koppers to fill their needs for pressure-treated crossties, poles, piling and lumber that will give decades of maintenance-free service.



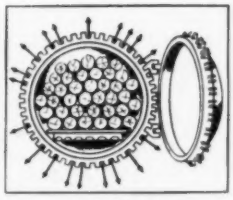
IF YOU SPECIFY OR BUY— You'll want to see this four-page booklet, "Pressure-Treated Lumber, Plywood, Poles, Piling, Timber." Write:

KOPPERS COMPANY, INC.
Wood Preserving Division
1472 Koppers Building
Pittsburgh 19, Pa.

G-9



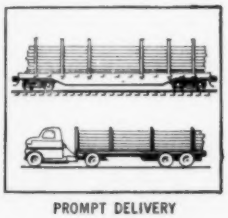
SCIENTIFIC FORESTRY



ENGINEERED PRESERVATION

QUALITY CONTROL

DEPENDABLE SOURCE



PROMPT DELIVERY

KOPPERS

KOPPERS
PRESSURE-TREATED
WOOD

FOR NEARLY HALF A CENTURY — MAKING AMERICA'S TIMBER RESOURCES SERVE BETTER, LONGER

BAKED ENAMEL
METAL FORESTRY SIGNS
for WOODLAND BOUNDARY MARKERS—NO TRESPASSING & FIRE WARNING SIGNS—LOCATION MARKERS—CRUISER TAGS—etc., any size to your specifications. WRITE FOR QUOTATIONS ON ALL YOUR SIGN NEEDS state size and quantity.
A. L. LIND COMPANY
5036 THOMAS AVENUE SOUTH
MINNEAPOLIS 10, MINNESOTA

SILVA COMPASS
Simpler — More Accurate
Recommended by foresters for cruising. Easier to use, faster, positive. Direct course readings. *Write for free literature and instructions.*
SILVA, INC., Dept. J, LaPorte, Ind.
RANGER MODEL

For over ten years
a dependable source
for
Southern
Pine
Seed
SOUTHERN SEED
COMPANY INC.
Baldwin, Georgia

For FASTER Pruning
USE THE
BARTLETT
MEYLAN SAW
Specially designed for pruning coniferous plantations, this saw will save up to 25% in time on all work. Man of average height can prune 9½ feet above ground without ladder. Blade made of special grade tool steel, 7 teeth per inch. Tapered handle is 36" long.
M-414, 16-inch blade, $12.00
M-414, 18-inch blade, $12.50
Delivered in U.S.A
BARTLETT TREE PAINT
for treating all pruning wounds. Pure Egyptian black asphalt base protects against fungi. Will not crack, blister or freeze. In cans and drums, 1 pt. to 50 gal.
Write for catalog No. 37 showing complete line of tree surgery tools and supplies.
BARTLETT MFG. CO.
3015 E. Grand Blvd. Detroit 2, Mich.

work of the National Park Service. This "temporary" appointment was the beginning of a quarter-century in conservation work with the Department.

"After serving in progressively more important positions in the National Park Service, Mr. Shanklin was selected in 1942 for transfer to the Office of the Secretary for specific assignment to administration of the Department's wartime emergency forest and range fire control program. In the closing months of World War II, his duties gradually were broadened to include all phases of forest management of concern to the Department. These include the protection of forests from fire, insects and disease, timber utilization, and related conservation activities.

"Mr. Shanklin long has been active in forestry organizations, and in conservation work of the Boy Scouts of America. In February of this year he was awarded the Boy Scouts "Silver Beaver" in recognition of his important role in the development of the organization's long-range camping program."

Wildlife Officials Named

Arnie J. Soumela, a Department of the Interior official since 1954, was nominated by President Eisenhower in February as Commissioner of Fish and Wildlife, a new post created by the Fish and Wildlife Act of 1956. Responsibilities of the position are to coordinate activities of the two component bureaus of the Fish and Wildlife Service, the Bureau of Sport Fisheries, and the Bureau of Commercial Fisheries. The Commissioner serves directly under the Assistant Secretary for Fish and Wildlife, Ross L. Leffler.

Daniel H. Janzen, who has been with the Fish and Wildlife Service and its predecessor, Bureau of Biological Survey, since 1929, was named director of the Bureau of Sport Fisheries and Wildlife on the resignation of John L. Farley.

Study Reveals Need for $83 Million for Nonfederal Forest Fire Protection

Eighty-three million dollars is needed annually for forest fire protection on 432 million acres of nonfederal land according to a study recently completed by the states, the U. S. Department of Agriculture announces. These estimates were compiled by the Forest Service from reports of 44 states and Hawaii which participate in the state-federal

GROW TREES
FOR XMAS TREES AND FORESTRY
Fir, Pine and Spruce in Variety
Seedlings and Transplants
Write for Price List
Suncrest Evergreen Nurseries
P.O. Box 305-G, Homer City, Penna

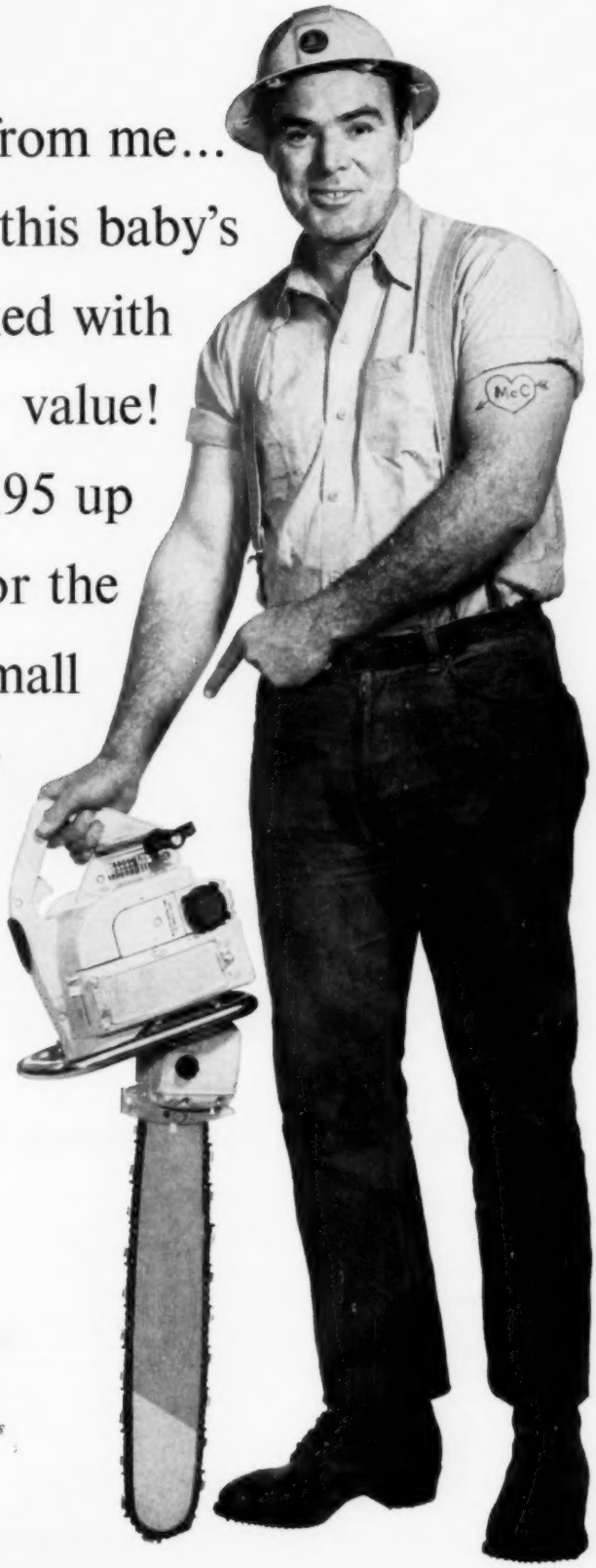
TREES FOR FOREST PLANTING
PINE•SPRUCE
We have grown Pine, Spruce and other conifers for 50 years.
KEENE FORESTRY ASSOCIATION
BOX 378, KEENE, NEW HAMPSHIRE

COMPLETE INVENTORY
CRUISING SCALE
Hypsometer Biltmore Scale
Rigid When Open
Flexible 6-foot Steel Tape $3.00 EACH
Handy Chrome-plated Case 1¾" Dia.
CARL W. GETZ, *President*
KURFEW, INC.
Lansdale, Pa.

Twenty-Sixth
PANAMA
Anniversary
- B. B. Fan Drive Pumps
- B. B. Slip-on Units
  Pump and Engine
- Slip-on Units Complete
  Pump, Engine, Tank, Completing Materials, All on Steel Skids
- Compensating By-passes
- High Pressure Hose
- Pistol Grip Cut-offs
- Combination nozzles
- Vacuum Lift Systems
- Automatic Float Valves
- Tree Marking Guns
  Pressure Type
- Pyramid Drip Torches
  With Preheating Burner
- Flame Guns
- Angle Gauges
  For Estimating Basal Area

Write For Free Catalog
PANAMA PUMP CO.
P.O. Box 689
Hattiesburg, Mississippi

Take it from me...
this baby's
packed with
value!
Just $195 up
for the
small
but mighty
McCulloch 35.



McCULLOCH

McCULLOCH

Los Angeles 45, California

World's largest chain saw builder

Makers of Scott-Atwater outboards

5-6007

From this step on, Dow chemicals help it grow

Some day—sooner than you think—this will be the center of a new forest.

The time from seedling to saw log will be cut because Dow chemicals will keep this new timber crop free of competing trees, brush and weeds.

Dow weed and brush killers cleared the way to make this planting possible. The forester will use these new chemical tools again to keep brush and over-topping hardwoods from hiding the conifers and competing for soil nutrients.

Logging crews will be at work here years earlier . . . and they won't have to beat their way through the brush to harvest the timber. Chemicals like Esteron* 245, Esteron Brush Killer, Kuron*, Baron* and Radapon* will also keep rail lines, logging roads, firebreaks free of unwanted vegetation.

Dow sales and technical men will show you how to use Dow herbicides and silvicides in modern forest management. They'll show you, too, how these same chemical tools can mean greater safety and convenience all around your mill. For further information write to: THE DOW CHEMICAL COMPANY, Agricultural Chemicals Sales Dept., Midland, Michigan.

*Trademark of The Dow Chemical Company

YOU CAN DEPEND ON DOW

cooperative forest fire protection program, and have been confirmed by the executive committee of the Association of State Foresters.

This new cost figure compares to $48 million estimated for the protection of 426 million acres in 1950, the time of the last survey, and $42 million actually spent in 1956 to protect 387 million acres of nonfederal land.

Increased cost estimates were due primarily to higher goals for protecting forest and watershed lands. The states hope to reduce the acreage burned; the lands are becoming increasingly valuable for timber, water for power and domestic use, and recreation. The protection problem has been intensified by the drought which has increased the fire hazard in many areas so that more men and equipment are needed.

Also, many states have increased pay of fire control personnel to bring it in line with prevailing wage rates. Others, confronted with a manpower shortage, plan to buy more mechanized equipment which is costly.

Each state studied its own forest situation to determine a realistic and justifiable estimate of annual protection costs. This field inventory took one year.

Guidelines for the inventory were worked out jointly by the Forest Service, state forestry agencies, and their cooperators.

Cost Sharing of Forest Fire Protection to be Studied

The U. S. Department of Agriculture announced in March that an industrial research firm (Battelle Memorial Institute, Columbus, Ohio) has signed a contract with the Forest Service to make a study of ways the federal government, states, and private landowners can share cost of protecting non-federal lands from forest fires.

The study will determine the dollar value of the resources of non-federal forest and watershed lands which should be protected from fire. It will include the degree of forest fire protection needed for these lands, the fire protection now given, and the extent to which the public agencies and private owners should share in the cost of this protection.

In arriving at recommendations the researchers will consider such things as the number of woodusing industries dependent on the forest crop, the number of people employed in these industries, the volume and value of water from these lands, together with expenditures already made for water control.

Trends in the federal-state cooperative forest fire protection program will be analyzed with regard to the area protected, number of fires and acreage burned on the protected lands, likelihood of fires starting or spreading on areas to be protected, and the value of forest fire protection. It will also analyze expenditures which have been made by federal and state agencies and private landowners under the Clarke-McNary Act.

To help obtain information and give technical assistance in the study, Battelle will add three foresters to its staff: J. H. Price, former regional forester for the Forest Service's North Central Region; George L. Drake, forestry consultant, and former vice-president of the Simpson Lumber Company; and Arthur S. Hopkins, executive secretary of the Northeastern Forest Fire Protection Compact, and former state forester of New York.

Special advisors include Stanley G. Fontanna, dean, School of Natural Re-

(continued on page 408)

Another Ben Meadows Special

Entirely NEW to American Forestry
÷ The "Blume-Leiss" Altimeter ÷

An unequaled instrument in intensified forest management . . . for measuring tree heights . . . and for simple levelling. A precision tool especially valuable for the advanced planner. Constructed of light weight metal . . . fits in the palm of your hand . . . weighs only 11 ounces. All moving parts are completely enclosed to prevent damage from dust or shock.

Readily visible . . . five scales . . . 45′, 60′, 90′ and 120′ for measuring tree heights . . . and also, a degree scale for slope measurements . . . to level roads and ditches, etc. Scales are protected from rain, fog, dust and other hazards by a non-breakable cellulose window.

The optical base-line measurer is equipped with a yellow filter to prevent glare. Folding "Pertinax" target with white marks for base line of 45, 60, 90 and 120 feet . . . 3 feet, 10 inches long . . . folds into 8 inches for convenient carrying.

Knife-like pendulum swings freely . . . settles quickly . . . assures a quick and accurate reading . . . can be locked or released without removing instrument from eye.

Correction for measurement in mountainous country . . . to satisfy the most meticulous woodsman. Read heights directly from scale up to 180 feet . . . greater capacity by lengthening base line.

The "BLUME-LEISS" Altimeter is offered for the first time to American forestry . . . used for more than 20 years by European foresters.

EXAMINE FREE . . . for 10 days after receipt . . . if not entirely satisfied return to me with no cost to you. Supply is limited due to capacity of manufacturer . . . so you must act now. Send me your order today.

Price, including sturdy leather case with shoulder strap . . . $52.35 plus postage.

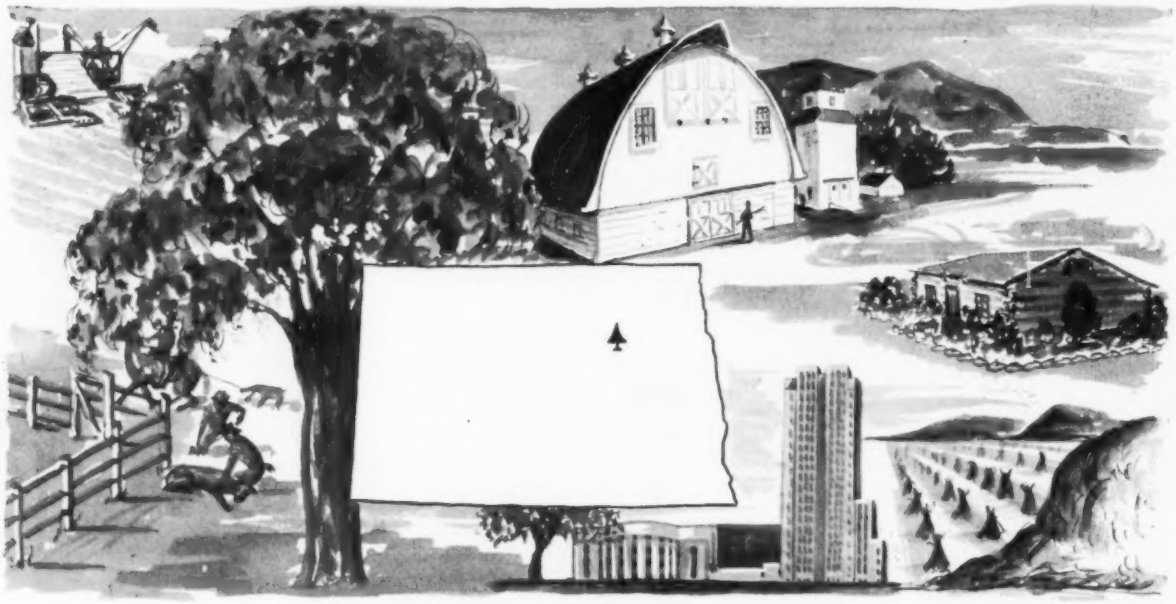
THE BEN MEADOWS CO.

FORESTRY TOOLS AND EQUIPMENT

P.O. BOX 93, N.S. STA., ATLANTA 5, GA.

Telephone CEdar 3-2601

No. 31 in a series featuring forestry practices, projects and products . . .



NATIONAL FORESTS

North Dakota

North Dakota is famous for its hard red spring wheat, flax, beef cattle, potatoes and migratory waterfowl hunting grounds. Few people associate the state with forestry.

Yet, approximately 100,000 acres have been planted to tree windbreaks in North Dakota's shelterbelt project. Today, the area encompasses the eastern third of the state, and each year, about six million additional trees are planted to temper the prairie winds.

This interest in forestry began with the pioneer settlers of North Dakota, who, coming mostly from forested areas, were evidently struck by the meagre native forest,—a total of about 1% of the state area. Their state constitution provided that there be a state school of forestry, to encourage tree planting.

Thus began the North Dakota School of Forestry, a junior college at Bottineau which celebrates its golden anniversary in 1957. This School of Forestry is also the state's forestry agency, responsible for North Dakota's forestry program. It operates two nurseries, at Bottineau and Towner, to supply trees to farmers for windbreaks and shelters.

Two other nurseries operated by the State Association of Soil District Supervisors and several commercial nurseries also furnish trees for these purposes.

Windbreaks and shelters are the primary resource of trees in North Dakota's wide open spaces. Possibly the greatest concentration of windbreaks and shelterbelts in the United States is located in Grand Forks County, within North Dakota's vast shelterbelt project.

Native forests are limited, largely, to the bottomlands of the Red, Cheyenne, James, Missouri and Little Missouri Rivers, and to the Killdeer Mountains, the Pembina Hills, the Turtle Mountains and the Bandlands,—where annual rainfall averages 16 or more inches. Native species,—green ash, cottonwood, trembling aspen, bur oak, basswood and paper birch,—are used largely for fence posts and fuel. Relatively small amounts of home sawn lumber are supplied by the 132 sawmill owners shown by the state's 1956 census.

NORTH DAKOTA SCHOOL OF FORESTRY—*contribution to this series does not necessarily constitute endorsement of* SOUTHERN GLO *products.*

The slip-on quart package of ready-mixed SOUTHERN GLO is acclaimed by many foresters as the ultimate in tree marking paint convenience. No thinning, mixing or prolonged stirring . . . no messy filling or cleaning of containers. Just attach the can to a Nelson paint gun and you're ready to mark.

In addition to this custom-tailored package, SOUTHERN GLO is available, ready-mixed, in flat gallon containers with the easy pouring spout, in conventional round gallons, and in drums. Or choose for the economy mark, SOUTHERN GLO paint paste . . . for super endurance, boundary paint.

If you have any marking problems, we will be glad to recommend the type most suitable for your marking program, or to send a copy of our booklet "Marking Trees with Paint"—free, upon request.

SOUTHERN COATINGS AND CHEMICAL CO. Dept. 2, Sumter, South Carolina—New Orleans, La.

SPEEDS HAUL ROAD DOZING

- **Allis-Chalmers Tornado Turbulence Diesel Engine . . . provides high output, big reserve capacity, and extra long life.**
- **Easy-Shift, Constant Mesh Transmission . . . means less shifting time, more production time.**
- **All-Steel Welded Main Frame . . . permits better equipment mounting, improved weight distribution.**
- **True-Dimension Heavy-Duty Tracks . . . are strong and durable for dependable service and long track life.**
- **Double-Reduction Final Drives . . . assure maximum ground clearance and increased gear life.**

Here are just a few HD-11 features that reflect Allis-Chalmers advanced design. They're features that give you the right combination of power, balance and strength to handle the toughest dozing jobs faster and more economically. These advantages will save time and money on your haul road and other forest jobs. See your Allis-Chalmers dealer. Allis-Chalmers, Construction Machinery Division, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS *Engineering in Action*

Consulting Foresters

Professional Services Offered by
Members of the Society of American Foresters

Land Surveyors *Consulting Forest Engineers*

BELANGER and BOURGET

86 MOUNTAIN HILL, QUEBEC,
P.Q., CANADA

Forest Surveys and Inventories. Establishing of boundary lines.

Forest Management and Logging plans. Locations for Wood industries.

POMEROY & McGOWIN

FOREST MANAGERS

Monticello, Arkansas Chapman, Alabama

GEORGE BANZHAF & COMPANY

422 North Water Street MILWAUKEE 2 BRoadway 6-2002

Consultants to the Wood Using Industries

KEITH CRANSTON, Forestry Consultant

Service to Industry — Personnel Placement
1. Listing of men available for jobs
2. Listing of jobs and employment possibilities

Leland, Mississippi — Headquarters in the Delta Hardwoods

A Southwide Professional Service

FOREST MANAGEMENT

Topographic Mapping
Timber Stand Maps
Land Classification

Forest Development Studies
Forest Inventories
Forest Appraisals

Hammon, Jensen & Wallen

MAPPING AND FORESTRY SERVICES

660 HEGENBERGER ROAD OAKLAND 21, CALIFORNIA

General Photogrammetric and Forestry Consulting Services

TIMBERLAND MANAGEMENT, INVENTORY AND APPRAISAL
—OVER 50 MILLION ACRES SINCE 1910

JAMES W. SEWALL COMPANY
FOREST ENGINEERS
OLD TOWN, MAINE

BRANCH: JAMES W. SEWALL CO. (CANADA) LTD., FREDERICTON, NEW BRUNSWICK

sources, University of Michigan; W. F. McCulloch, dean, School of Forestry, Oregon State College; L. J. Freedman, vice-president (retired), Penobscot Chemical Fibre Co.; J. E. McCaffrey, vice-president, International Paper Co.; C. G. McLaren, vice-president, National Container Corp.; John L. Aram, vice-assistant to the president, Weyerhaeuser Timber Co.; Charles L. Wheeler, vice-president, Pope and Talbot, Inc.; and Ernest F. Swift, executive secretary, National Wildlife Federation.

The study is expected to take a year to complete.

Harrison, Nygren Promotions Announced

Regional forester A. W. Greeley has announced that C. Lewis Harrison of Escanaba, supervisor of the Upper Michigan National Forest since 1949, has been promoted and transferred to Rolla, Mo., where he will serve as supervisor of the Missouri National Forest. He replaces Byron Groesbeck who has retired.

This will be Harrison's second tour of duty in Missouri. He served as assistant supervisor of the Clark National Forest from 1937 to 1941. He was later assistant supervisor of the Upper Michigan Forest, and subsequently supervisor of both the Huron National Forest in Michigan and the Wayne National Forest in Ohio.

Harrison's replacement at Escanaba is Harold Nygren, who was promoted from a position in the Division of Timber Management in the Milwaukee Regional Office.

Nygren graduated from the State University College of Forestry at Syracuse University in 1936. He served on various technical forestry assignments on the national forests of Michigan, Missouri, and Minnesota, and at one time was in charge of the Eveleth Forest Nursery in Minnesota. This was followed by tours of duty as a forest ranger on the Mississippi and the Clark National Forests. He served on special forest insect control projects in Colorado and in 1952 he was transferred to Ironwood, Michigan as Assistant Supervisor of the Ottawa. In 1954 he was transferred to the regional office of the Forest Service in Milwaukee. He has worked with the forestry organizations of the nine states of the Region in cooperative forest fire prevention projects and currently is in the Logging Plans and Engineering Section of the Division of Timber Management.

Porcius F. Crank, Jr.
Consulting Forester
Point Harbor North Carolina

FOREST PROPERTY
Estimates—Appraisals—Management
Prentiss & Carlisle Co., Inc.
107 Court Street Bangor, Maine

PAUL T. WINSLOW
Consulting Forest Engineer
ESTIMATES—APPRAISALS—MANAGEMENT
STAATSBURGH-ON-HUDSON, N. Y.

POND & MOYER CO., INC.
Consulting Foresters
Estimates—Appraisals—Surveys
Machine Tree Planting Service
107 HOMESTEAD RD., ITHACA, N. Y.

THOMAS G. CLARK,
CONSULTING FORESTER
FOREST LAND MANAGEMENT CO.
P. O. BOX 1046
MORGANTOWN, W. VA.

NAT'L. TIMBER CONSULTANTS
COMPLETE TIMBER SERVICES
SALEM, MISSOURI

TREE FARM MANAGEMENT SERVICE
1166-7th Avenue, West, Eugene, Oregon
Protection—Reforestation—Inventory
Utilization—Research
Verne D. Bronson, Chief forester, Phone 5-5371

NORTHEAST FORESTRY SERVICE
STANLEY MESAVAGE, *Consultant*
Forest Management
Timber Production
Forest Products Marketing
HAWLEY PENNSYLVANIA

JACK M. HALL
Consulting Forester
Appraisals - Selective Marking
Machine Tree Planting Service
MOULTRIE, GEORGIA

BYRON L. GROESBECK

Missouri Forester Retires

Byron L. Groesbeck of Rolla, supervisor of the Missouri National Forests, retired March 31 after 37 years of service, according to an announcement by Regional Forester A. W. Greeley. Groesbeck has been forest supervisor at Rolla since 1945.

Groesbeck entered the Forest Service in his native state of Colorado in 1920. There followed various assignments on the national forests of Colorado, Michigan, and Minnesota. In 1934 he was appointed supervisor of the Chequamegon National Forest in Wisconsin, and later served as supervisor of the Wayne National Forest in Ohio. From there he moved to the Regional Office in Milwaukee and served in a number of assignments until he was promoted to the supervisorship of the Clark National Forest in Missouri in 1945. When the northern ranger districts of the Clark Forest and all of the districts of the Mark Twain National Forest were consolidated in 1953, he assumed charge of the combined units.

Groesbeck's successor at Rolla is C. Lewis Harrison, since 1949 supervisor of the Upper Michigan National Forest with headquarters at Escanaba, Mich.

Supervisor Transferred to Washington Office

The transfer of Homer J. Hixon, supervisor of Gifford Pinchot National Forest, to the Washington Office as a staff assistant in the office of the chief of the Forest Service, has been announced by Regional Forester J. Herbert Stone. Hixon has been supervisor

WILLIAM A. EASTMAN, JR.
Consulting Forester
Complete Professional Service
SEATTLE 1, WASHINGTON
410 J. GREEN BUILDING
Phone SEneca 2814

PAUL M. SANDERS
Consulting Forester
916 YEON BLDG.
PORTLAND 4, OREGON
Telephone: CApitol 8-3536

TIMBER MANAGEMENT SERVICE
J. E. HALL R. W. MEZGER
FORESTRY CONSULTANTS
Technical Assistance to Timberland Owners and Operators in the Ponderosa Pine Region
Klamath Falls, Oregon

WILLIAM H. PRICE
FOREST MANAGEMENT
Specializing in
Timber Tax Problems
2626 W. Lynn—Seattle 99, Wash.
Al der 7482

FRANK J. LEMIEUX
Forester
833 WHITNEY BUILDING
NEW ORLEANS, LA.

Consulting Forester Forest Surveyor
JOHN STOCK
Specializing in Adirondack Forest and Tax Problems
Box 311 Tupper Lake, N. Y.

ADIRONDACK FORESTRY, INC.
David E. Strong, Consultant
Estimates, Appraisals, Marketing
Management Plans, Tree Planting
Wood Preservation
WILMINGTON, NEW YORK

ALBERT G. HALL
Forestry Relations Counsel
Consulting Forester
Member, Association of Consulting Foresters
810 18th St., N.W., Washington 6, D.C.

NORTHERN TREE COMPANY
Professional Forestry Services
Thomas F. Schweigert, Pres.
Member, Association of Consulting Foresters
Penney Building
Petoskey Michigan

on the forest since July 1953.

Hixon received his original appointment on the Gifford Pinchot in 1937. He subsequently served on the Rogue River, Colville, and Mt. Baker National Forests. From 1946 to 1953 he was in charge of inventories, plans, and records in the regional division of Timber Management, Pacific Northwest Region, Portland.

Hixon graduated from the University of Washington in 1932 with a B.S. in forestery. He holds honorary membership in Sigma Xi (Science), Phi Sigma (Biology), and Zi Sigma Pi (Forestry).

Government May Be Sued for Negligence in Fighting Forest Fires, Court Rules

The Supreme Court has ruled 7-2 that the federal government may be sued for damages suffered by private parties as a result of U. S. Forest Service negligence in fighting forest fires.

The ruling reversed a federal district court decision that the government is immune from such liability, and sent the case back to that tribunal for rehearing. The action was brought by Rayonier, Inc., in the state of Washington.

The decision was regarded as a significant departure by the Supreme Court from one of its earlier opinions that public firemen are not liable for carelessness or negligence in fighting fires. In its ruling, the court established a new basis for determining liability—whether under similar circumstances a private party would be liable for the damages sought against the government.

R. B. SHANNON & ASSOCIATES
KITTANNING, PA.
REGISTERED SURVEYING
CONSULTING FORESTRY
PHOTOGRAMMETRIC
CARTOGRAPHY
Phone: Kittanning 42-4941

Reforestation Arboriculture
S. GAYLEY ATKINSON
Consulting Forester
Huntingdon Road
Huntingdon Valley, Pa.

FLOYD IVERSON

Iverson Heads International Region

Floyd Iverson, assistant regional forester in the Intermountain Region of the U. S. Forest Service at Ogden, Utah, since 1955, has been named regional forester there, the U. S. Department of Agriculture has announced.

He succeeds Chester J. Olsen, who retired in April. Mr. Iverson's position as head of range and wildlife management will be filled by William D. Hurst, assistant chief of the Division of Range Management in Washington, D. C. since 1955.

Iverson previously headed up wildlife and range management for the Forest Service's Northern Region. He received his BS degree in forestry from the University of California in 1933.

Mr. Hurst received his BS degree in forestry from Utah State Agricultural College in 1938. He was first employed by the Forest Service in 1937 on the Wasatch National Forest. Later he served in various capacities, including forest supervisor in the Intermountain Region, before assignment in Washington.

New Canadian Forestry Branch Director Appointed

J. D. B. Harrison, chief of the forest research division of the Forestry Branch, Department of Northern Affairs and National Resources, has been appointed director of the Forestry Branch. He succeeds Dr. D. A. Macdonald who recently retired.

Mr. Harrison studied forestry at the University of New Brunswick and was graduated in 1924. He was awarded the degree of Master of Science, Forestry, from the University of New Brunswick in 1934.

From 1935 until 1946, Mr. Harrison held a number of appointments at Ottawa, including chief of the Economics Division of the Forestry Branch, assistant to the Deputy Timber Controller of the Department of Munitions and Supply, and supervisor of the Statistics Division of Timber Control.

In 1946, Mr. Harrison was attached to the Food and Agriculture Organization of the United Nations as chief of the economics section of the forestry division. In this capacity, he was responsible for estimates of the world's forest resources, for studies of forest inventory methods, and statistics of forest products. He was appointed chief of the Forestry Branch's Forest Research Division in 1951 and has served in this position until his present appointment.

Mr. Harrison was president of the Canadian Society of Forest Engineers (now the Canadian Institute of Forestry) in 1943 and 1944.

Oregon Forestry Department Announces Compton Promotion

Miles Compton, executive assistant in the Oregon forestry department in charge of insect and disease control as well as the state's forest fee and yield tax law, has been promoted to the position of district supervisor for eastern Oregon, according to State Forester Dwight L. Phipps. The appointment became effective March 1.

In his new position Compton will have supervision over all protection matters in the five state and association protective units which comprise some 4,000,000 acres of eastern Oregon forest and grazing lands. Compton graduated from the school of forestry at Oregon State College with the class of 1934.

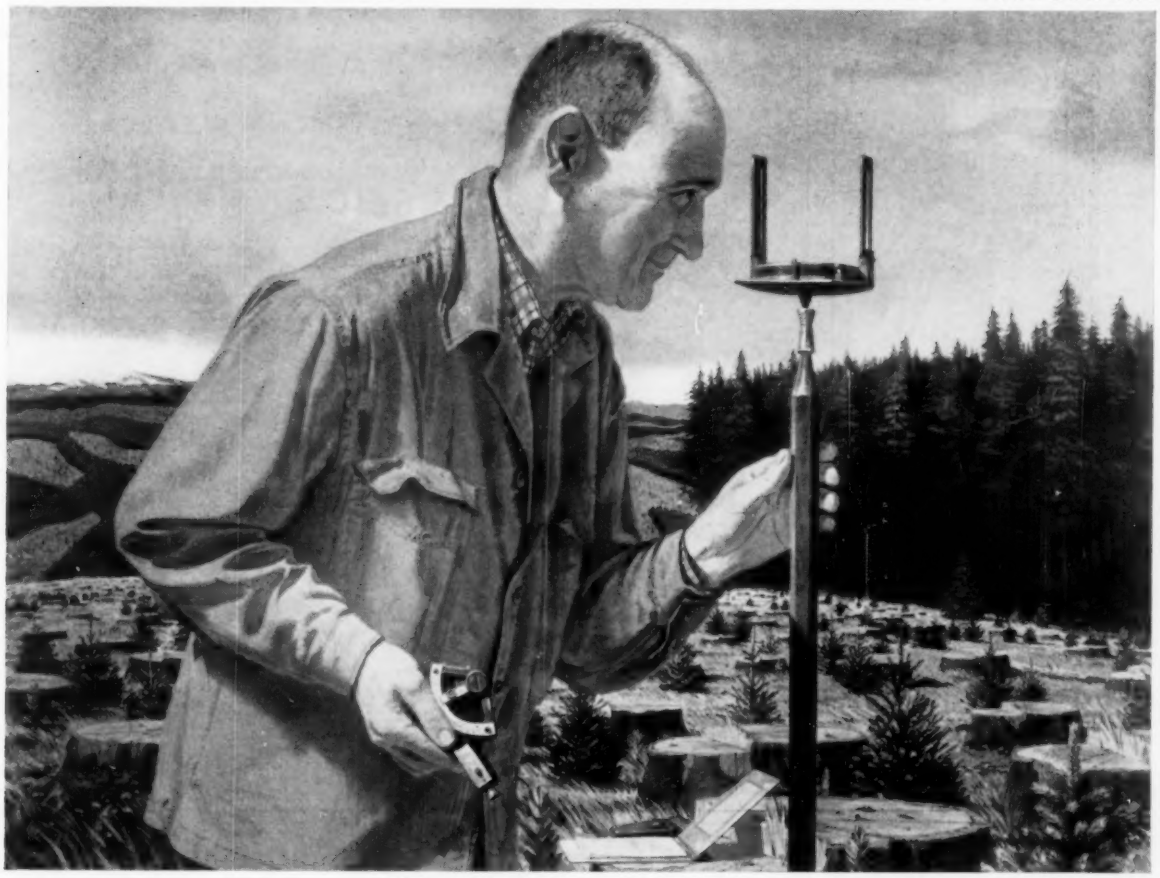
J. Morgan Smith Transfers to Eastern Region

J. Morgan Smith, Jr., recently assumed the duties of assistant chief of the Division of Information and Education in the Eastern Region, U. S. Forest Service, at Upper Darby, Pa.

For the past eight years Smith has been assistant director of the Forest Service's Cooperative Forest Fire Prevention Program in Washington, D. C.

Succeeding him in the Washington office is J. F. Grant of the Rogue River National Forest, Oregon.

MAKING WOOD SERVE AMERICA BETTER THROUGH GOOD FOREST MANAGEMENT



DAVID T. MASON, member, Society of American Foresters. A U. S. Forester, 1907-15, he later taught forestry at a major university, resigning in 1921 to become a consulting forest engineer. Credited with playing a major role in furthering the adoption of sustained yield forestry, he helped lay the foundation for a permanent forest industry in America.

planning a future for the industrial forests of America...

Beautiful, strong and versatile, wood is America's most popular building material. To assure an endless supply, tree farmers grow timber as a crop in repeated cycles.

The promise of a perpetual wood supply for the United States depends on *systematically managed* forestlands . . . not on *untended wildlands.* Aware of this fact more than 30 years ago, David T. Mason began a strong crusade to promote sound management of industrial forestlands. Through practical surveys and persuasion, he helped win wide acceptance of sustained yield forestry, under which the volume of timber harvested is kept in balance with the amount of new wood grown. He and other foresters also worked to bring about a favorable economic climate that encouraged industry to grow repeated crops of timber on a long-range business basis.

Today's tree farm management practice is sustained yield forestry in action. Industrial tree farmers plan for the future, keeping forestlands productive by growing crop after crop of trees to replace those harvested. Across the nation, more than 9,700 tree farms, owned by companies and by individuals, are dedicated to this scientific method of forest management... a total of about 41 million acres of commercial timberland.

All Weyerhaeuser Timber Company forestlands are tree farms. *Write us at Box A. Tacoma, Washington for a free booklet, Promise of the Trees.*

Weyerhaeuser Timber Company

WEYERHAEUSER

4-SQUARE

CARRIED OVER....

That's right! We have really got something hot. So we are extending our SPECIAL "TWIN-DEAL" COMPASS-CLINOMETER offer to *June 30, 1957.*

DON'T DELAY! SAVE $5.00 by ORDER TODAY. These two fine instruments would cost you $29.95 if bought separately. BUY TOGETHER as TWINS and SAVE $5.00.

JUST SAY "TWIN-DEAL" ..... $24.95 POSTPAID

You'll love the SUUNTO TWINS. Each is only 2 inches wide, 5/8 inches thick, 2 3/4 inches long and weighs only 4.2 ounces. LOOK at them and see what each can do for you.

High Accuracy Pinpointing Compass

High Accuracy Clinometer

Scale is subdivided 0 to 360 degrees and can be read accurately to 10 angle *minutes;* liquid filled needle container; quick settling needle.

To operate, turn compass so that the hair line, when viewed through the lens, points to the object, the compass bearing of which is desired. By optical illusion, the hair line appears to rise above the frame surface and is easily seen. Simultaneously the direction is indicated on the compass scale immediately behind the hairline. Direct reading, direct sighting. Most accurate. Table of cotangents on compass back.

COMPASS, complete with real leather case, Item 2C-40 ..... $13.95 each, POSTPAID

Clinometer scale is halved. Left side is divided 0 to ± 90 degrees in one degree divisions. Right side is graduated 0 to ± 150 per cent in one per cent divisions. Accuracy 10-15 angle minutes; liquid filled needle container; rapid stopping scale.

For elevation or slope, sight hair line at object, viewing object with left eye and hairline with right eye simultaneously. This produces super-imposed image of object, hairline and scale. Can be used as hand level or hypsometer. In close places angle can be read directly through side window. Clinometer backside presents table of decimals of angle cosines. REPLACE YOUR ABNEY HAND LEVEL NOW, with a lighter, more compact and accurate instrument AT LESS COST.

CLINOMETER, complete with real leather case, Item 2C-45 ..... $16.00 each, POSTPAID

PHONE — WRITE — WIRE — COME TO

FORESTRY SUPPLIERS, INC.

P. O. BOX 8305 — BATTLEFIELD STATION
JACKSON, MISSISSIPPI

P.S. We've got a multitude of other fine forestry items, too.

Three Return From Taiwan Project

E. L. Demmon, H. Dean Cochran, and Tom Gill have completed an assignment in Taiwan under the ICA and have returned to the United States.

The group was engaged in completion of the forestry development program which was begun in 1951. The Joint Chinese-American Rural Reconstruction Commission conducted the program which was directed by Paul Zahngraff.

Messrs. Demmon and Cochran, both retired from the U. S. Forest Service, spent four months on Taiwan, and Mr. Gill, executive director of the Charles Lathrop Pack Forestry Foundation, was there during December.

Weyermann to St. Joe Forest

George F. Weyermann, assistant supervisor since 1953 of the Flathead National Forest with headquarters at Kalispell, Mont., has been named to succeed George Duvendack as supervisor of the St. Joe National Forest, St. Maries, Idaho, according to Regional Forester Chas. L. Tebbe.

A graduate of the School of Forestry, University of Idaho, Weyermann received his appointment with the Forest Service in 1941 and was assigned to the regional forester's office in Missoula. Subsequently he held positions on the St. Joe, Kootenai, Coeur d'Alene and Clearwater Forests. He worked on special programs in the Northern Rocky Mountain Forest Experiment Station during 1951 and 1952 and conducted timber planning projects in the regional division of Timber Management at Missoula in 1953.

Gunnison Forest Supervisor Transfers to Idaho

Sam E. Defler, supervisor of the Gunnison National Forest at Gunnison, Colo., effective in April, became supervisor of the Payette National Forest with headquarters at McCall, Idaho.

The Payette National Forest is one of the largest in the United States with ten ranger districts and a smoke jumper center. Much of it is in a designated Primitive Area and accessible only by trail or aircraft.

A graduate of the State University College of Forestry at Syracuse University, Defler began his career in the Forest Service in 1937. His appointment as supervisor of the Gunnison Forest came in August 1953.

G. H. Duvendack New Supervisor of Gallatin Forest

George H. Duvendack, formerly supervisor of the St. Joe National Forest with headquarters in St. Maries, Idaho has succeeded James C. Urquhart who retired in February as supervisor of the Gallatin National Forest, headquarters at Bozeman, Mont.

Duvendack joined the Forest Service in 1930. In 1945, following three years of military service, he became assistant supervisor of the Kaniksu National Forest, and in 1947 transferred to the office of the chief of the Forest Service in Washington, D. C. where he headed communications activities. In 1951 he was appointed supervisor of the St. Joe National Forest. He is a graduate of the Colorado School of Mines.

Education

L. P. Plumley Heads Ranger School at Wanakena

Dr. Hardy L. Shirley, dean of the State University College of Forestry at Syracuse University, announced in March that an alumnus of the Ranger School, Lucian P. Plumley, associate professor of forestry at the College, was named director of the New York State Ranger School at Wanakena, N. Y., effective March 1. He becomes the seventh director of the school and succeeds Professor James F. Dubuar, who is retiring after 38 years as head of the Ranger School.

Up to the present time, Professor Plumley, in addition to his other duties, has been assistant to Dean Shirley.

Professor Plumley was born in Buffalo and is an alumnus of the New York State Ranger School, class of 1931. A bachelor's degree was conferred upon him by the College of Forestry in June 1935.

After graduation from college, he was appointed to the research staff of the Northeastern Forest Experiment Station, Upper Darby, Pa.

He resigned from that position in May 1936, when he was appointed to the Ranger School faculty as an instructor. In January 1943 he was transferred to the Forestry College campus at Syracuse. There, he was assigned to the Department of Forest Extension. Professor Plumley was promoted to assistant professor on April 1, 1945, and one year later became associate professor and assistant to the dean.

TREES OF THE WESTERN PACIFIC REGION
by J. Hugo Kraemer, Ph.D.
This book contains descriptions of the common trees and their woods found in the region from Burma to the Solomon Islands, including the Philippines. Descriptions include botanical names, local names, habit, leaves, flowers, fruit, bark, wood (description, uses, etc.) and occurrence accompanied by drawings of leaves, flowers and fruit. This book is unique in American literature. Invaluable to foresters, botanists and others interested in trees and their products.
436 PAGES. 156 FIGURES. CLOTH BOUND
Price $5.50
Order from TRI-STATE OFFSET CO.
817 Main St. Cincinnati 2, Ohio

Photogrammetric
STEREOSCOPES - STEREOMETERS
SKETCHERS - PLOTTERS
HARRISON C. RYKER, INC.
1209 - 8th Ave. Oakland, Calif.

CUT COSTS 90%
PREVENT ACCIDENTS
• WASH WINDOWS FOUR STORIES HIGH
REMOVE LIGHT GLOBES 60 ft. up
• PRUNE TREES & PICK FRUIT 60 ft. up

Send for Free Catalog
DEPT. J . 300 S. Los Angeles St., L.A. 13, MA 6-9397

TO GET ALL THESE SAVINGS
In TIME, PAINT, and MONEY

NOZZLE CAP
To prevent paint drying-in — Another Nelson exclusive, saves nightly cleaning.

REVERSIBLE NOZZLE
To eject plugs quickly, cuts "time out" to clear clogged guns.

ADAPTOR AND QUART CAN
Permits screwing can direct to gun — eliminates funnels, canteens and sloppy paint transfers.

NON-SETTLING PAINT
Saves hours wasted in stirring — makes marks that endure and twice as many per gallon.

USE BOTH THE NEL-SPOT GUN and NELSON TREE MARKING PAINT

Both save time. Both save paint. Use them together and Nelson's Paint-Can-Gun, "all 3 in one," mark more trees for less money than any other combination of paint and marking tools you can buy.

WRITE — Dept. JF-9

THE NELSON COMPANY
1236 Prospect Avenue
Iron Mountain, Michigan

Texas A & M Offers Research Assistantship

A recent announcement of the availability of a research assistantship leading to the Ph.D. degree in the field of forest biology, effective September 1, 1957, was made by the Texas Forest Service, a part of the Texas A & M College system. The amount of the assistantship on a 12 month basis is $2,085 a year for a resident student or $2,400 a year for an out-of-state student. Both sums include allowance for matriculation fees.

Candidates holding a master's degree from an accredited institution in one of the plant sciences are preferred.

For further information regarding the assistantship, inquiries should be addressed to the Director, Texas Forest Service, College Station, Texas. For additional information about academic matters, inquiries should be addressed to the Dean, Graduate School, A & M College of Texas, College Station, Texas.

Awards Henry Schmitz Scholarship

The Henry Schmitz Student Leadership Scholarship was recently awarded by the University of Minnesota School of Forestry to Phillip H. Jaquith of Milwaukee, Wis.

Carlyn C. Delavan Retires

Dr. Hardy L. Shirley, dean of the State University College of Forestry at Syracuse University, has announced that Professor Carlyn C. Delavan, professor of forest engineering and director of the College of Forestry's summer camp at Cranberry Lake for the past 27 consecutive years, retired in January.

He is being appointed to the rank of professor emeritus and retires after reaching the mandatory retirement age limit for State University employees—65. He has put in one of the longest periods of service in the rank of full professor of any faculty member at the College of Forestry.

Private & Industrial

Virginia Forests, Inc. Employs Administrative Assistant

Bradford T. Dempsey has been employed by Virginia Forests, Inc., as administrative assistant. He will assist William E. Cooper, the executive director, in expanding and intensifying the program of the Association so that it can be of greater service to the membership and to the people of Virginia.

Dempsey is a 1946 graduate of the New York State Ranger School at Wanakena, N. Y., and a 1951 graduate of the American International College at Springfield, Mass., where he obtained a BA degree in biology. Subsequently, he graduated from the National Hardwood Lumber Association Inspection School in Memphis, Tenn., receiving his certificate in 1954.

During the past year, Mr. Dempsey has been employed by the *National Hardwood Magazine*, Memphis, Tenn., as its eastern representative. Principal duties of the new assistant, will be in the advertising, membership soliciting, and sales portion of the Association program.

Clouston New Executive Secretary of Range Management Society

John G. Clouston has accepted the position of executive secretary of the American Society of Range Management. He assumed his new duties after retiring from the U. S. Forest Service.

At the time of his retirement, Mr. Clouston was in charge of range activities in the Pacific Northwest Region's division of Range, Wildlife, and Watershed Management. Except for a six-month assignment with the Army in 1943, he has worked for the Forest Service since his graduation from Washington State College in 1923.

He is a charter member of the American Society of Range Management.

E. F. Steigerwaldt Becomes Consultant

Edward F. Steigerwaldt has announced his resignation as forest inventory supervisor for the Forest Management Division of the Wisconsin Conservation Department to enter the consulting forestry field. Steigerwaldt joined the department in 1947 as a photo interpreter and progressively assumed positions of greater responsibility in inventory work. He earned his bachelor's and master's degrees in forestry at the University of Michigan in 1943 and 1947 respectively. He was commissioned in the Corps of Engineers in 1944 and trained in military photo interpretation. Overseas service included duty with the Natural Resources Section of General MacArthur's Headquarters in Tokyo. He was released in 1946.

Steigerwaldt's address is Star Route 2, Tomahawk, Wis.

New Forest Management Firm Organized in Louisiana

A new forest management firm was organized recently in Alexandria, La., by Frank W. Bennett and Robert H. Cain.

Incorporated under the name of Tree Farmers, Inc., the new organization offers all professional services of the consulting forester, and in addition contracts any or all phases of forest management work.

Tree Farmers, Inc., is located on MacArthur Drive in Alexandria.

Western Pine Elects Hood New President

A. B. Hood, general manager of the Ralph L. Smith Lumber Co., Anderson, Calif., has been elected 14th president of the 440-mill member Western Pine Association. He succeeds A. L. Helmer, Polson, Mont., who has led the group for the past two years.

Gair Woodlands Again Offers Forestry Scholarships

For the fourth year Gair Woodlands Corp., Savannah, Ga., has announced the continuation of its program of providing two $2,000 forestry scholarships annually. Scholarships are offered to outstanding high school graduates in specified counties in Georgia, South Carolina, and Florida. They provide $500 per year for four years of professional studies. Successful applicants are permitted to indicate their preference to acquire forestry training at the University of Georgia, University of Florida, or North Carolina State College.

William Maughan Enters Consulting Field

William Maughan, for the past 9 years forester with the Cary Lumber Co. of Durham, N. C., and previously for 17 years professor of forest management at Duke University, has announced his entrance into consulting forestry work. He expects to specialize in appraisals, valuation, purchase and sale of timberlands, long term management of forest properties, and special problems associated with litigation and taxation. Maughan is an engineering and forestry graduate of the University of Minnesota, with a graduate degree in forestry from Yale. His address is 5 Sylvan Road, Durham, N. C.

St. Regis Graduate Fellowship Winner Announced

St. Regis Paper Co. announces the award of its fellowship in forestry to Barney Dowdle, a senior student in the College of Forestry at the University of Washington, Seattle. Mr. Dowdle, a native of Sedro-Woolley, Wash., will receive his B.S. degree in June and plans to continue his forestry education at Yale University in September. He will use his grant to study forest economics with some emphasis on the pulp and paper industry.

The committee making the award was composed of Dr. R. E. McArdle, chief of the U. S. Forest Service; Dr. V. L. Harper, chief of research of the U. S. Forest Service; William R. Adams, St. Regis vice president in charge of manufacturing; and Paul M. Dunn, St. Regis technical director of forestry.

The fellowship, valued at $1,000, is given for one year. This is the fifth year St. Regis has made the award.

W. J. Damtoft Receives Award

Walter J. Damtoft of the Champion Paper and Fibre Co., Canton, N. C., received the Forester's Achievement Award for 1956 from the North Caro-

SAFEST, SIMPLEST DRIP TORCH YOU CAN USE

FORESTER Seal-Tite Torch

Provided with fuel trap, check valve and flash-back screen to protect you from explosion hazards.

Welded tank with cushion base, double bottom, oil proof gaskets and tight valves SEALTITE against leakage.

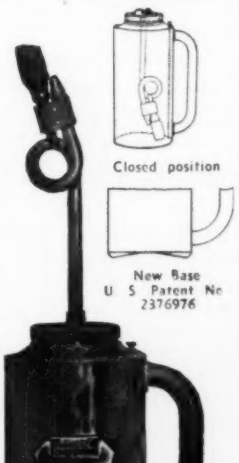
No Pressure—No Preheating. Burns diesel oil, stove oil or mixed fuels with low flash-point.

Approved for use by U. S. Forest Service

Manufactured By

WESTERN FIRE EQUIPMENT CO.

69 Main St. San Francisco, California



NEW SOCIETY PUBLICATION AVAILABLE

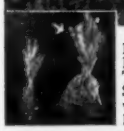
Forest Practices Developments in the United States, 1940-1955

Report of the Committee of Forest Practices, Division of Silviculture, Society of American Foresters, Kenneth P. Davis, *Chairman*.
The report is in three parts: (1) highlights of major developments affecting forest practices during 1940-1955, (2) digest and summary of present state legislation on cutting practices, and (3) annotated bibliography with a key to 1940-1955 literature.

Price $1

SOCIETY OF AMERICAN FORESTERS
MILLS BUILDING WASHINGTON 6, D. C.

20 MILLION TREES *a Year!*



NOTE: Heavy Roots and Sturdy Tops of Musser Seedlings compared with ordinary seedlings.

Seedlings for Christmas Tree and Forest Tree plantings. Transplants for Conservationists, Timber Operators and Farmers. All from selected seed with good heredity characteristics. Our tremendous volume means wide selection at a *price saving* to you. For example:—

NORWAY SPRUCE—Fast growing
2-yr., 5., 5-10", per 1000 ..... $35.00

Write for Free Catalog
with wholesale planting list. Ask for Free Christmas Tree Growers' Guide.

MUSSER FORESTS, INC. Box 26-E INDIANA, PA.

INDEX TO ADVERTISERS

	Page
Adirondack Forestry, Inc.	409
Aermotor Company	400
Allis-Chalmers	407
Atkinson, S. Gayley	410
Banzhaf & Co., George	408
Bartlett Mfg. Company	402
Belanger & Bourget	408
Blue Jet Corporation	338
Caterpillar Tractor	3rd Cover
Clark, Thomas G.	409
Crank, Porcius F., Jr.	409
Cranston, Keith	408
Dow Chemical Co.	404
Eastman, Jr., Wm. A.	409
Fechheimer Bros. Co.	400
Forestry Suppliers, Inc.	412
Georgia-Pacific Corporation	395
Hale Fire Pump Co.	398
Hall, Albert G.	409
Hall, Jack M.	409
Hammon, Jensen & Wallen	408
Homelite Corporation	Back Cover
Keene Forestry Assoc.	402
Koppers Company, Inc.	401
Kraemer, J. Hugo	413
Kurfew, Inc.	402
Lemieux, Frank Jr.	409
Lind, A.L.	402
Lowther Co., Harry A.	397
Lufkin Rule Co.	399
McCulloch Motors Corp.	403
McCurdy Bros. Nurseries	400
Meadows, Ben	405
Melin Meteorological Service	397
Musser Forests	415
Nat'l. Timber Consultants	409
Nelson Company	414
Northeast Forestry Service	409
Northern Tree Company	409
Pacific Marine Supply	396
Panama Pump Co.	402
Pomeroy & McGowin	408
Pond & Moyer	409
Poulan Chain Saws	398
Prentiss & Carlisle, Inc.	409
Price, William H.	409
Rich, C. H. Forest Fire Tool Co.	397
Ryker, Harrison C. Inc.	413
Sanders, Paul M.	409
Sandvik Steel, Inc.	399
Sebrell Corporation, J. B.	413
Sewall Company, James W.	408
Shannon, R. B. & Assoc.	410
Silva, Incorporated	402
Smith, D. B. Company	2nd Cover
Southern Coatings & Chem. Co.	406
Southern Seed Company	402
Stock, John W.	409
Sunerest Evergreen Nurseries	402
Timber Mgmt. Service	409
Tree Farm Mgmt. Service	409
Utility Tool & Body Co. Inc.	397
Western Fire Equipment	415
Weyerhaeuser Timber Co.	411
Whitmire Research Labs., Inc.	400,413
Winslow, Paul T.	409

GEORGE A. CRAIG (above) became secretary-manager of Western Lumber Manufacturers, Inc. on March 1. With headquarters in San Francisco, he will work for better understanding between government agencies responsible for the disposal of publically owned timber and the industrial firms dependent upon that timber. Craig, who is a University of California forestry graduate, has for the past seven years been associate editor of *The Timberman*. In his new position he succeeds retiring Perry A. Thompson who became secretary-manager of the organization when it was formed in 1952.

lina Forestry Association.

The award read, "In recognition and appreciation for your outstanding contribution to the development of Forestry in North Carolina."

Allied

Gutermuth Receives Aldo Leopold Memorial Award

C. R. Gutermuth, vice president of the Wildlife Management Institute, received The Wildlife Society's Aldo Leopold Memorial Award at the annual banquet of the 22nd North American Wildlife Conference in Washington, D. C., on March 5. The award, given by the professional society in recognition of distinguished service to wildlife conservation, commemorates the late Aldo Leopold.

Dr. Durward L. Allen, president of the Society, who made the presentation, cited Gutermuth for his "outstanding contributions to improved wildlife legislation and administration, effective public relations work, and leadership as an officer of national resources organizations."

Forestry Employment

S.A.F. members are privileged to insert one 60-word advertisement in this column without charge. Forest industries desiring to employ foresters may insert advertisements at the rate of $4 per column inch. Copy must be received by the end of this month for an advertisement to appear in the issue after next.

Obviously, the Society cannot assume responsibility beyond making it possible for prospective employee and employer to enter into negotiations.

Positions Wanted

Forester. Woodlands executive. Age 49 years. Thirty years experience in Northeast from timber cruiser to assistant woodlands manager, producing 500,000 cords annually. Wants position offering best use of training and experience.
Box F, Journal of Forestry, Mills Building, Washington 6, D. C.

Forester, B.S.F., 1936. Married; 4 children; veteran. 17 years experience in timber management, sales administration, cruising, marking, scaling, general management. Now with U. S. Forest Service. Desire position in private industry, preferably western pine region.
Box G, Journal of Forestry, Mills Building, Washington 6, D. C.

Forester, graduate Oregon State College, 1956. Age 27, married, no children, veteran. Currently employed in West as timber appraiser on large and small holdings. Experienced in modern inventory methods, aerial photography, and field contact of small owners. Desire work with progressive concern or individual. Will consider any locality.
Box H, Journal of Forestry, Mills Building, Washington 6, D. C.

Forester, candidate for M. F., in forest management, age 27, married, two children, former Air Force officer, commercial pilot rating; university teaching experience, desires a position offering opportunity and a minimum of traveling. Prefer the East.
Box I, Journal of Forestry, Mills Building, Washington 6, D. C.

Public Relations Director. M.S., in forestry, New York State and eight years extension experience dealing with general public, woodland owners, and wood using industries. Desire work with large or small growing private industry.
Box J, Journal of Forestry, Mills Building, Washington 6, D. C.

Graduate forester. Age 25, single, farm background; recently separated from the Army. Experience limited to summer employment. Will accept any location except South. Desire position offering opportunity for advancement.
Box K, Journal of Forestry, Mills Building, Washington 6, D. C.

Forester, B.S., 1950. Age 36, married, 4 children. Six years on-the-ground experience; three with U.S.F.S., three in industry, mostly in technical application of forestry in logging management and timber purchase. Have good knowledge of logging-lumbering cost accounting, contracting and timber appraisal.
Box L, Journal of Forestry, Mills Building, Washington 6, D. C.

Graduate forester, also degree in Foreign Trade from The American Institute for Foreign Trade. Age 29, veteran, married, no children. Experience in all phases of importing and exporting lumber and related products. Diversified intensive training in timber management. Presently employed. Prefer foreign employment in forestry or related fields.
Box M, Journal of Forestry, Mills Building, Washington 6, D. C.

D8 with No. 8S Bulldozer spreads material which has been dumped for fill by D8-No. 80 Scraper unit, approaching in the background with another load.

NEW ACCESS ROAD OPENS WAY FOR FIRST LARGE SALE OF LODGEPOLE IN DEERLODGE NATIONAL FOREST

On January 15, last year, Naranche & Konda Construction Co. started building 7.4 miles of timber access road for the U. S. Forest Service in the Philipsburg Ranger District, Deerlodge National Forest, Montana. This Butte contractor had been awarded the job with a bid of $110,000. The job involved clearing timber, grading, graveling and drainage for a 14-foot-wide road to EE14 specifications. Earthmoving yardage totaled about 90,000. The job, completed in midsummer, cleared the way to reach large stands of lodgepole timber in the Green Canyon area. The first sale, held in May last year, was for 20,000,000 bd. ft.

Mainstays of production for Naranche & Konda on this job were two CAT* D8 Tractors and a No. 12 Motor Grader. The new D8 was equipped with a No. 8S Bulldozer, while its older brother was matched with a No. 80 Scraper. Materials handled were dirt and rock, with the older unit hauling and the new one doing such chores as push loading, installing a steel culvert pipe and spreading the material dumped on the fill. The units worked 8 hours a day, 6 days a week, with a minimum of down time. Operator Edward A. Nelson made this comment on the new D8's performance: "The torque converter is good for pushing. It gives steady power. It's good for 'dozing, too."

Torque converter *or* direct drive, you get your choice in the modern heavy-duty D8. This rugged machine packs 191 HP (flywheel) and is built to do more work with less down time at lower cost than any other unit in its power range. See your Caterpillar Dealer for proof of performance. Better still, name the date—he'll demonstrate!

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

CATERPILLAR*

*Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

After digging out the ditch, this D8-No. 8S Bulldozer unit eases material up to the culvert. Hydraulic steering clutches provide positive control for precise maneuvering.

WANTED—
THE HARD WORK

The most powerful one-man chain saw you can own

You can make every type of cut with the Homelite 7-29 — notching, felling, limbing, bucking, boring, and undercutting. And you'll cut more wood faster, in even the most difficult terrain because the 7-29 is perfectly balanced for all-position, all-angle operation with no adjustment, no loss of power.

You get top production in the biggest timber because the 7-29's seven full horsepower lets you cut down trees up to 10 feet in diameter quickly. Yet its 29 pounds makes it light enough for jobs in small trees.

You can be sure of smooth, dependable, economical operation, because the 7-29 is precision-built to Homelite quality standards featuring a high-compression, short stroke engine which prolongs life, cuts gas consumption, assures quick starting in the most adverse weather conditions.

7 HORSEPOWER

29 POUNDS

Ask for a Free Demonstration Today!

Complete Line of Chain Saws for every Cutting Job

Model 17 — an all-purpose saw that brings down trees up to 4 feet in diameter. Available with special brush cutting and clearing attachments for complete versatility. 3½ horsepower, 20 pounds.

Model 5-20 — All the versatility of the 17 with added power. 5 full horsepower — 20 pounds. Brings down trees up to 6 feet in diameter.

Model EZ — lightest, most powerful direct drive chain saw ever developed. Only 19 pounds, full 5 horsepower. Brings down trees up to 3 feet in diameter.

HOMELITE

Manufacturers of Carryable

PUMPS • GENERATORS
BLOWERS
CHAIN SAWS

A DIVISION OF TEXTRON INC.

4105 RIVERDALE AVENUE, PORT CHESTER, NEW YORK

In Canada: Terry Machinery Co., Ltd.